CURRÍCULUM VITAE
ING. DAVID CISNEROS CASTRO

JOB AND EXPERTISE SUMMARY

GENERAL INFORMATION

- Birth Date: October 1st., 1949
- Birth Place: Otatitlán, Ver, México
- Nationality: Mexican
- Status: Married
- Height: 1.75 Mts.

dcisneros49@hotmail.com

EDUCATION

- Degree: Mechanical Industrial Engineer

  Instituto Tecnológico Regional de Orizaba, Ver.
- Foreign Language: English

SPECIAL TRAINING PROGRAMS

• Excecutive Program	Sloan School of Management Massachusetts Institute of Technology
• Top Management Program	IPADE
• Creating World Class Manufacturing Enterprises	Carnegie Mellon University Instituto Tecnológico y de Estudios Superiores de Monterrey
• Quality and Productivity Special Studies	Japón, Singapore, Malaysia (13 Companies visited)
• Quality and Productivity Diplomate	Instituto Tecnológico y de Estudios Superiores de Monterrey
• Personnel Strategic Management	Instituto Tecnológico y de Estudios Superiores de Monterrey

TRAINING AND COURSES

• International Supplier Quality Assurance	Xerox Rochester, N.Y.
• Technical Production Supervision	Centro Industrial de Adiestramiento
• Transactional Analysis for Supervisors	Xerox (México)
• Procedures and Policies Development	Xerox (México)
• Managerial Studies Program	Xerox (México)
• Engineering Administration	Infotec (Instituto Nacional de Fomento Tecnológico)
• Scientific and Effective Engineering Administration	Center for Professional Advancement (Chicago, ILL)
• Advanced Supervision Seminar	Xerox (México)
• Multi – National Drawing Interpretation	Xerox (Rochester, N.Y.)
• Quality Circles for Managers and Company Directors	IMECCA (Instituto Mexicano de Control de Calidad)
• Leadership Resource Planning Through Quality	Xerox México Manufacturing
• MRP II	Xerox (México)
• Advanced Performance Manager Training	Aubrey Daniels & Associates (Atlanta, Georgia)
• Managerial Capacities Development	ICAMI (Instituto Capacitación Medios Intermedios)
• Statistical Process Control (SMIP)	Southern California Manufacturing Operations
• Advanced Management Program	Xerox (Rochester, N.Y.)
• Management by Facts	Xerox (México)
• Empowerment	Xerox (México)
• Reengineering	Xerox (México)
• Six Sigma	Xerox (México)
• Lean Manufacturing	Xerox (México)

WORKING EXPERIENCE

• Strategic Planning Manager	Quality & Manufacturing Consulting Actual
• Lean Manufacturing and Manufacturing operations Consultant	Pyrosmart Actual
• Manufacturing Operations Consultant	Mercantil de Perfiles Perez Feb. 2013 – Jul. 2013
• Aguascalientes Logistic Platform Commercial Leader	Grupo Tracomex Jul. 2011 - Jan. 2013
• Aguascalientes Government, Economy Promotion Sub-Secretary	Economic Development Secretary Jan. 2006 – Nov. 2010
• Quality, Planning and Projects Director	Aguascalientes Estate Water Institute Dec. 2004 – Dec. 2005
• Institutional Planning and Development Director	Universidad Politécnica de Ags Aug.2003 – mar.2004
• Manufacturing Services Director	Flextronics Manufacturing Jan. 2002 – Apr. 2003
• Digital Product and Operations Support Business Unit Director	Xerox Mexicana Jun. 1999 – Dec. 2001
• Mid-Volume Business Unit Director	Xerox Mexicana Apr.1999 – May. 1999
• Plant Services and Human Resources Director	Xerox Mexicana Jan.1997 – Apr.1999

• Mid-Volume Products Business Unit Director	Xerox Mexicana Apr. 1991 – Dec. 1996
• Low Volume Products Business Unit Director	Xerox Mexicana Apr. 1991 – Dec. 1996
• Technical Support Director	Xerox Mexicana Jul 1988 – Mar. 1991
• Manufacturing Operations Manager	Xerox Mexicana Oct. 1986 – Jun. 1988
• Product Quality Manager	Xerox Mexicana Oct. 1984 – Sep. 1986
• Quality Engineering Manager	Xerox Mexicana Sep.1983 – Sep.1984
• Advanced Manufacturing Engineering and New Programs Eng. Manager	Xerox Mexicana Feb. 1981 – Aug. 1983
• Quality Control Supervisor Engineer	Xerox Mexicana Sep. 1977 – Jan. 1981
• Quality Control Senior Engineer	Xerox Mexicana Jun. 1976 – Aug. 1977
• Supplies Quality Assurance Engineer	Xerox Mexicana Jun. 1975 – May. 1976
• Quality Control Engineer	Xerox Mexicana Jan. 1974 – May 1975
• Mechanical Maintenance Chief	Manufacturera 3M 1973 – 1974
• Sugar Cane Quality Engineer	1972 Kimberly Clark – México
• Mechanical Maintenance Practitioner	1972 Kimberly Clark - México

SIGNIFICANT TEAMWORK EXPERIENCES

1989	National Quality Award Process
1993	ISO 9002/ ISO 14001 Certificate process
1993	Development and implementation of Organization by Business Unit Concept
1993	Development and implementation of Manufacturing Unit Costs Improvement (UMC)
1996	Aguascalientes XEROX Plant Strategic Planning for 1997 to 2000
1997	Aguascalientes XEROX Plant Strategic Planning for 1998 to 2001
1997	Development and Implementation of the Recycling Materials Plant Project
1997	Development and Implementation of the DIF Protegee Workshop

SPECIAL AKNOWLEDGEMENTS

1980, 1986, 1992, 1996, 1997, 1999	Presidents Club
1989	Special Merit Increase
1992	Key Position Merit Increase
1993	Award to "Professional Excellence" Villa Asuncion Rotary Club
1998	Technological Institutes Enterprise Development Award
1996	Veracruz Port Distinguished Visitor

EXTERNAL ORGANIZATIONS INVOLVEMENT

- Xerox Mexicana Representative (now Flextronics) to the Aguascalientes Industrial Group.
- Aguascalientes Training Institute Management Council Member
- Transformation Industry National Chamber Vice-president
- Consultant for the Fundacion Produce Aguascalientes A.C.
- Strategic Planning and Productivity Projects Professor and Consultant at the Universidad Autonoma de Aguascalientes
- Citizens Net Member for the Territorial Reorganization of Aguascalientes Estate
- Total Quality Concepts Professor and Consultant at the Instituto Tecnologico de Aguascalientes
- Secretary of Organization for the Sorority of Veracruz

LECTURE TEACHING

- Escuela Superior de Comercio y Administración (IPN)
- Instituto Tecnológico y de Estudios Superiores de Monterrey
- Universidad Bonaterra de Aguascalientes
- Instituto Tecnológico de Veracruz
- Instituto Tecnológico de Orizaba
- Instituto Tecnológico de Aguascalientes
- Universidad Autónoma de Aguascalientes
- Instituto de Administración Pública del Estado de Aguascalientes
- Universidad del Valle de México

SPECIALIZED MAGAZINES INTERVIEWS

• Expansion Magazine	Productivity Topics
• America Economics Magazine	Aguascalientes-State Development

VI. Entregables

VI.1 Reporte y conclusión de cada uno de los objetivos específicos determinados en el proyecto, de acuerdo al cronograma de la metodología de trabajo propuesto.

- El aluminio ACD no es muy conocido en la industria electrónica. De acuerdo a los resultados de las entrevistas, existen otros materiales que se utilizan con éxito en la industria, como alambre de aluminio y acero inoxidable.
- La gran parte de las empresas del sector, obtienen sus insumos del extranjero, por lo que el desarrollo nacional tiene que ser altamente competitivo en costos y calidad para una penetración exitosa en el mercado.
- A Flex Aguascalientes le interesa entrevistarse con la empresa JIDOKA para conocer las aplicaciones y ventajas del aluminio ACD, incluso proporciona datos de contacto de desarrollo de proveeduría.

VII. Bibliografía

Portafolio 2 de Nov 2015.
Books ScribD. Es.scribd.com
Metalúrgica Lagilla. www.lagilla.com
www.cnnexpansión.com
http://www.almexa.com.mx/
http://www.agenciasinc.es/

.ACD Aluminum Products Specialized Information Market Study Consuming the Electronics and Electronics Components Industry in Mexico

I.INTRODUCTION

I.1 General information on aluminum

I.2 Definition ACD and applications

II. Objetive general study.

III. An analysis of the technological environment to logical

III.1 International

III.2 National

IV. Specific Objetives

IV.1 Information on the technology required for manufacturing processes of aluminum ACD products.

IV.2 Competence analysis of applied technology for ACD aluminum products used in the electronics industry in Mexico.

IV.3 Field analysis of applied technology in the product shows in the electronics industry in Mexico.

IV.4 International standards and standards for technology and manufactured products for the electrical and electronic industry.

IV.5 Identification of electronic companies in Mexico that require applied aluminum ACD technology.

IV.6 Identify complementary products of aluminum ACD products

V. METHODOLOGY WORK

V.1 Definition of the problem

V.2 Development of the problem approach

V.3 Formulation of research design

V.3.1 Elaboration of interview formats

V.3.2 Development of control matrix

V.4 Field work or data collection

V.5 Customer Interviews:

- Phone calls
- Depht Interviews
- Focus group

V.6 Preparation and analysis of data

V.7 Preparation and submission of the report

VI. Deliverables

VI.1 Report and conclusion of each of the specific objectives determined in the project, according to the schedule of the proposed methodology of work.

I. **Introduction**

I.1 General information on aluminum

Aluminum is a chemical element, symbol A1 and atomic number 13. It is a non-ferromagnetic metal. Aluminum compounds make up 8% of the earth's crust and are present in most rocks, vegetation and animals. In the natural state it is found in many silicates (feldspar, plagioclase and micas). As metal it is extracted only from the mineral known as bauxite, to be transformed first into alumina by the Bayer process and in metallic aluminum by electrolysis. This metal has a combination of properties that make it very useful in materials engineering, such as its low density (2700 kg / m^3) and its high resistance to corrosion. Suitable alloys can significantly increase their mechanical strength (up to 690 MPa). It is a good conductor of electricity and heat, it is easily machined and very cheap. For all this is since the middle of the twentieth century the metal that is most used after steel.

Aluminum is one of the most abundant elements of the earth's crust (8%) and one of the most expensive metals to obtain. The annual production is about 33.1 million tons, with China and Russia the most outstanding producers, with 8.7 and 3.7 million respectively. A

very important part of world production is the product of recycling. In 2005 it represented approximately 20% of total production.

Only 5% of the **energy** required to produce the primary metal initially is needed in the **recycling process**

Total loss in the **re-melting** is less than **3%**

About 75% of aluminium ever produced **is still in use**

The raw material from which aluminum is extracted is bauxite, which receives its name from the French town of Les Baux, where it was extracted for the first time. Currently the main deposits are in the Caribbean, Australia, Brazil and Africa because the bauxite extracted there is more easily disintegrated. It is a mineral rich in aluminum, between 20% and 30% by mass, compared to 10% or 20% of the aluminum silicates existing in clays and coals. It is an agglomerate of various compounds containing kaolinite, iron oxide and titania quartz, and where aluminum is presented in various forms such as gibbsite hidróxidas Al (OH) $_3$, boehmite AlOOH and the AlOOH diaspore.

As already indicated, aluminum is produced in two phases: the extraction of alumina from bauxite (Bayer process) and the extraction of aluminum from the latter by electrolysis. Four tons of bauxite produce two tons of alumina and finally one of aluminum. The Bayer process begins with the grinding of bauxite and its washing with a hot solution of sodium hydroxide under high pressure and temperature. Soda dissolves the compounds of aluminum, which when found in a strongly basic medium, are hydrated:

$Al(OH)_3 + OH^- + Na^+ \rightarrow Al(OH)_4^- + Na^+$

$AlO(OH)_2 + OH^- + H_2O + Na^+ \rightarrow Al(OH)_4^- + Na^+$

Non-alumina materials are separated by decantation. The caustic solution of the aluminum is then cooled to recrystallize the hydroxide and separate it from the soda, which is recovered for further use. Finally, the aluminum hydroxide is calcined at temperatures close to 1000 ° C, to form the alumina.

$2\,Al(OH)_3 \rightarrow Al_2O_3 + 3\,H_2O$

The aluminum oxide thus obtained has a very high melting point (2000 ° C) which makes it impossible to undergo an electrolysis process. To overcome this problem, it is dissolved in a cryolite bath, obtaining a eutectic mixture with a melting point of 900 ° C. Electrolysis is then carried out by immersing carbon electrodes (both the anode and the cathode) in the vessel horizontally. Each ton of aluminum requires between 17 and 20 MWh of energy for its production, and consumes in the process 460 kg of carbon, which is between 25% and 30% of the final price of the product, making aluminum one of the Metals more expensive to obtain. In fact, alternative processes are being sought less expensive than the electrolytic process. The obtained aluminum has a purity of 99.5% to 99.9%, the impurities of iron and silicon being mainly. From the vats it goes to the furnace where it is purified by the addition of a flux or alloyed with other metals in order to obtain materials with specific properties. It is then poured into molds or made into ingots or sheets.

Pure aluminum is a soft material with little tensile strength. To improve these mechanical properties it is alloyed with other elements, mainly magnesium, manganese, copper, zinc and silicon, sometimes titanium and chromium are also added. The first aluminum alloy, the popular duralumin was discovered coincidentally by German metallurgist Alfred Wilm and its main alloy was copper. Currently aluminum alloys are classified in series, from 1000 to 8000, according to the following table.

Series	**Designation**	**Main alloy**	**Main compounds In the alloy**
1000 series	1XXX	99% at least of aluminum	-
Series 2000	2XXX	Copper (Cu)	Al_2Cu - Al_2CuMg
3000 Series	3XXX	Manganese (Mn)	$_6Mn$
4000 Series	4XXX	Silicon (Si)	-
5000 Series	5XXX	Magnesium (Mg)	$_3Mg_2$

6000 Series	6XXX	Magnesium (Mg) andSilicon (Si)	Mg_2Si
7000 Series	7xXX	Zinc (Zn)	$MGZN_2$
8000 Series	8XXX	Other elements	-

The 2000, 6000 and 7000 series are heat treated to improve their properties. The level of treatment is denoted by the letter T followed by several figures, of which the first defines the nature of the treatment. Thus T3 is a solution treated thermally and worked in cold.

Series 1000: really is not aluminum alloys but presence of impurities iron or aluminum, or also small amounts of copper, which is used for cold rolling.

Series 2000: the main alloying of this series is copper, as duralumin or avional. With a T6 treatment they acquire a tensile strength of 442 MPa, which makes it suitable for use in aircraft structures.

3000 series: the main alloying is manganese, aluminum strengthens and gives a tensile strength of 110 MPa. It is used to manufacture components with good machinability, ie with a good performance against machining.

4000 series: the main alloying is silicon.

5000 series: the main alloying is magnesium which reaches a strength of 193 MPa after annealing.

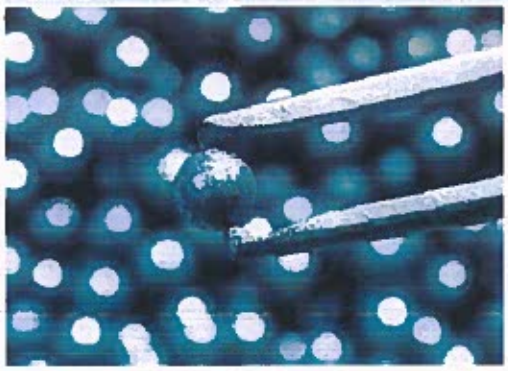
Series 6000: silicon and magnesium are used. With a T6 treatment it reaches a resistance of 290 MPa, suitable for profiles and structures.

7000 series: the main alloying is zinc. Undergoing a T6 treatment it acquires a resistance of 504 MPa, suitable for the manufacture of airplanes.

Characteristics

Valores de las Propiedades

Masa Atómica	26.98154 uma
Punto de Fusión	933.2 K
Punto de Ebullición	2740 K
Densidad	2698 kg/m³
Dureza (Mohs)	2.8
Potencial Normal de Reducción	-1.66V Al^{3+} | Al
Conductividad Térmica	237.00 J/m s °C
Conductividad Eléctrica	376.7 $(m\Omega hm.cm)^{-1}$
Calor Específico	877.8 J/kg °K
Calor de Fusión	10.7 kJ/mol
Calor de Vaporización	291.0 kJ/mol
Calor de Atomización	326.0 kJ/mol de átomos
Estados de Oxidación	+1, +3
1ª Energía de Ionización	577.6 kJ/mol
2ª Energía de Ionización	1816.6 kJ/mol
3ª Energía de Ionización	2744.7 kJ/mol
Afinidad Electrónica	42.5 kJ/mol
Radio Atómico	1.43 Å
Radio Covalente	1.18 Å
Radio Iónico	Al^{+3} - 0.45 Å
Volumen Atómico	10 cm^3/mol
Polarizabilidad	8.3 $Å^3$
Electronegatividad (Pauling)	1.61



Physical characteristics

Among the physical characteristics of aluminum, the following stand out:

- It is a light metal, whose density or weight spec fic is 2700Kg./m3 (2.7 times the density of water).
- It has a point of fusion or n low: 660 ° C (933K).
- The weight at or mico of aluminum is 26.9815.
- It is bright white.
- Good conductor of heat and electricity.
- Corrosion resistant ion, thanks to the layer of Al2O3 formed.
- Abundant in nature.

Mechanical characteristics

Among the mechanical characteristics of aluminum are the following:

- F easy to machining.
- Very malleable, it allows the production of l or n to mine very thin.
- Pretty d u ctil allows the manufacture cable or n the citrus é.
- Soft material (Mohs scale: 2-3).
- L í mite resistance in traction or n: 160-200N / mm2 [160-200MPa] pure, alloyed state the range is 1400-6000 N / mm2. Duralumin alloy is a particularly resistant or n.
- Material forming alloys with other metals to improve the mechanical properties niques
- It allows the manufacture of pieces or n or n foundry, forging and extrusi or n.
- Weldable material.
- CO2 absorbs twice the impact.

Chemical Characteristics

Atomic structure of aluminum:

- Due to its high state of oxidation or n is formed r to quickly air a thin impermeable and adherent surface layer of oxide or aluminum (Al u Al2O3 mine) that stops the process of oxidation or n, which provides resistance ny corrosion or durability. This protective layer of matte gray, can be extended by electronic or lysis in the presence of oxalates.
- Aluminum has character í or sticas anf Teras. This means that as strong bases to dissolve both acids (forming aluminum salts) (forming aluminates with ani or n [Al (OH) 4] -) or hydrogen releasing hydr. Or oxide layer formed on the aluminum to be dissolved in acid ci tric forming aluminum citrate.
- Aluminum readily reacts with HCl NaOH, rich or percl but generally resists corrosion due to rust or n or. However when Cl- ions Cu ++ and its pasivaci or n disappears and is very reactive.

Structure

Classification

Pure aluminum is soft, and therefore may not be ideal for building strong structures. For this use, mineral elements must be added to pure aluminum to make it stronger.These additional elements not only improve the hardness of the metal, but also improve their corrosion resistance. In addition, aluminum alloys subjected to heat treatment are stronger by the precipitation hardening process of aluminum, although the degree of hardness is different due to the addition of different mineral elements. 2024-T351 Aluminum The 2024-T351 rating aluminum is one of the strongest alloys of this stronger metal, widely used in the metallurgical industry. This alloy is easy to work, but becomes brittle when heated, so it can not be welded. Even if it is the strongest of all aluminum alloys, this naturally wears out fatigue, just as other types of aluminum do.

Some of the elements added to this alloy are manganese, magnesium and copper.
The classification of the 2024-T351 aluminum is used in various applications, such as riveting and aircraft contraction.

6061-T651 Aluminum

A 6061-T651 aluminum has moderate strength but is highly weldable, compared to the 2024-T351. Another advantage of this type of aluminum alloy is its resistance to corrosion. In a stable state, the alloy ages naturally and not artificially, compared to aluminum 2024-T351.

Aluminum 7075-T651

A 7075-T651 grade aluminum is strong and hard, with a corrosion resistance similar to that of 2024-T351 aluminum. However, when subjected to high temperatures, the 2024-T351 is stronger than the 7075-T651. This alloy shows excellent resistance to flat fractures and fatigue, however, the material loses its strength and hardness due to continuous wear and tear. 7075-T651 aluminum should not be exposed to high temperatures as its elements oxidize.

1100 Aluminum

The aluminum alloy 1100 is relatively soft at room temperature. In welding, it has a good ductility when working at relatively low temperatures. This alloy can be used to make tubes, plates, sheets and bars, and can be welded and molded easily due to its ductility.

Aluminum 7005

This aluminum alloy is stronger and harder than aluminum type 6061-T651, but both types have a strength and similar strength at room temperature. On the other hand, the strength of a weld of an alloy 7005 is greater than that of the 6061-T651, if compared to the same temperature.

History of aluminum and extraction

History

Aluminum is a material as old as man; And new, because it was hidden until a little more than a century ago. It seems that the name of aluminum comes from alum, aluminum salt used many centuries before Christ for various purposes. The analysis of the alumbres revealed the existence of a base that was called "alumina" (18th century).Invented by Volta the electric heap (XIX century), the sodium and potassium metal could be obtained by electrolysis of molten salts in the experiences of H. Davy, who failed in his attempt to obtain pure metallic aluminum. Industrial metal production is not achieved until St Claire Deville. In spite of everything, only a few kilograms had been obtained by this procedure at a totally disproportionate price. In 1867 the dynamo was invented, which contributed to the industrial production of aluminum by the current method: electrolysis of alumina in molten baths of cryolite.

The patents were presented simultaneously by CM Hall in the United States and PLT Héroult in France in 1886 and their processes constituted the foundations of the American and European aluminum industries. However, this process would not have developed so rapidly if, in addition to the discovery of the high-amperage DC generator, the process by which the alumina was obtained from the bauxites, which we must To KJ Bayer, and patented in 1889. The demand for aluminum has grown significantly due to its intrinsic properties and the lowering of production costs.

Currently trends tend towards moderate increases in consumption, depending on the development of countries. There is talk of an annual increase of 4% over the next few years, but a policy of empowering Third World countries can exacerbate world production.

In 1825 the Danish HC Oersted prepared an amalgam of aluminum (aluminum dissolved in mercury) by reaction of aluminum chloride with an amalgam of potassium.Subsequently distilled the preparation to remove the mercury and thus obtained impure aluminum as it still contained an appreciable proportion of mercury. Between 1827 and 1845, Friedrich Wöhler, a German chemist, improved the Oersted procedure using metal potassium: Cl3 Al + 3K = Al + 3ClK. He was the first to measure the specific weight of aluminum and show its lightness. In 1854 Henri Sainte-Claire Deville, in France, obtained the metal by reduction of aluminum chloride with sodium. Helped economically by Napoleon III, Deville built a large-scale experimental plant and showed pure aluminum at the Paris Exposition of 1855.

Extraction

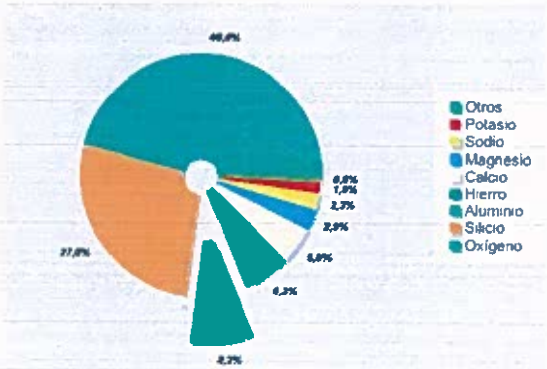
Aluminum is the most abundant metallic element in the earth's crust; Only the non-metals oxygen and silicon are more abundant.

Aluminum is never found as free metal; Usually as aluminum silicate or as a mixed silicate of aluminum and other metals such as sodium, potassium, iron, calcium and magnesium. These silicates are not useful minerals because it is chemically difficult, and therefore expensive, to extract aluminum from them.

Bauxite, an impure oxide hydrated aluminum, is the commercial source of aluminum and its compounds.

Indeed, in 1886 the world production of aluminum was less than 45 kg, and its price was somewhat higher than 11 dollars per kg. In 1989, by contrast, the estimated world production of primary aluminum was 18 million metric tons and the price of aluminum was less than $ 2 per kg.

Its name comes from the word alumen with the Romans designated substances with astringent properties.



It is mainly extracted from bauxite, a type of very abundant clay. Bauxite is a hydrated aluminum oxide, which almost always has a certain amount of iron oxide. It is whitish, gray or reddish; Amorphous, is present in coarse grains or in lytic ground masses. In addition to iron oxide, bauxite often contains titanium and silicon, simple substances that are extracted from the ore by a special process called the Bayer process. The Bayer process consists essentially of the following: Bauxite, finely pulverized, is carried, along with caustic soda, to large tanks where iron, titanium and silicon oxides are transformed into a sludge that is separated by filtration. The resultant liquid is subjected to several processes which convert it into a white powder, known as alumina, and which is aluminum oxide or alumina, which will be used to manufacture aluminum by electrolysis.

The main bauxite deposits in the world are located in Australia, Brazil, China, USA. France, Ghana, Greece, Guinea, Guyana, Haiti, Hungary, India, Indonesia, Jamaica, Malaysia, Dominican Republic, Romania, Sierra Leone, Suriname, Turkey, former USSR, Venezuela and former Yugoslavia. The main aluminum producers generally belong to the developed world, being the largest US, which produces more than a quarter of the world production, Russia, Japan, Canada, Germany, France, Great Britain, Spain and Italy.

Uses of aluminum

Aluminum is rarely used 100% pure and is almost always used alloyed with other metals to improve some of its characteristics. Pure aluminum is used mainly in the manufacture of mirrors, both for domestic use and for industrial use. Due to its high heat conductivity, it is used in cooking utensils and pistons of internal combustion engines. Its high strength in relation to its weight and its resistance to corrosion makes it useful in the construction of

aircraft, boats, profiles and other construction elements, railway wagons and chassis of cars and motorcycles and in general for all uses in Those that require strong and light metals. The main branches of use are the following: Aerospace, automotive and transportation. The extensive use of aluminum in the aerospace and automotive industries substantially reduces vehicle weight and fuel consumption, resulting in a significant reduction in carbon and greenhouse gas emissions. In hard marine environments, special aluminum alloys provide strength, ease of handling and corrosion resistance required in marine applications.

Building and Construction

Aluminum offers many advantages for the design, strength and shape of buildings. Aspect and finish properties, such as reflective surfaces, contribute to resource sustainability by improving energy efficiency, helping to achieve green building standards through the reduction of carbon emissions. Other applications in construction include windows, doors and enclosures. More than 90 percent of the aluminum used in buildings today is recycled repeatedly into similar products, without losing its quality.

Consumer goods

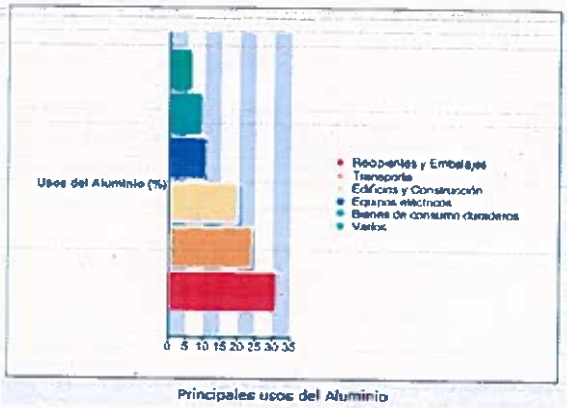
The increased use of aluminum in electronics and consumer goods results in finer, lighter and more durable products that also have desirable appearance and finish properties. The main examples are appliances and kitchen utensils. Aluminum is preferred by many product designers for its strength and for its contemporary aesthetic qualities.

Industrial applications

The unique characteristics of aluminum and its alloys are useful in the manufacture of cost-effective and excellent performance machinery. They are used in electric transmission lines, tools and parts, and many other industrial products. In addition to its light weight, aluminum and its alloys offer advantages in strength and durability, cryogenic behavior (very low temperature) and heat transfer capabilities, electrical conductivity, surface characteristics and corrosion resistance. Aluminum and its alloys have applications that meet specific needs of the oil and gas industry. These include deep water requirements for forgings, extrusions, drilling and production pipes, lightweight and high strength

Packaging

Foil and foil are manufactured in large quantities for a variety of packaging applications, including food and beverage packaging. Aluminum is among the most recyclable industrial materials; A great example is the ubiquitous aluminum cans, being almost 70 percent recycled in new cans or other products in about 60 days.



Principales usos del Aluminio

Extruded aluminum profiles

Extrusion is a technological process that consists in shaping or molding a dough by making it come out through an opening specially arranged to achieve complicated design profiles.

It is achieved by the use of a continuous flow of the raw material, usually metallurgical or plastic products. The raw materials are subjected to melting, transport, pressure and deformation through a mold depending on the profile to be obtained.

Aluminum due to its properties is one of the metals that is most used to produce varied and complicated types of profiles that are used mainly in the constructions of metallic carpentry. Both primary and secondary aluminum obtained by recycling can be extruded.

To make the extrusion, the raw material is supplied in cylindrical ingots also called "billets". The extrusion process consists of applying a pressure to the aluminum cylinder (billet) by passing it through a mold (matrix), to achieve the desired shape. Each type of profile has a "mold" called an appropriate matrix, which determines its shape.

The billet is heated (about 500 ° C, at which temperature the aluminum reaches a plastic state) to facilitate its passage through the die, and is introduced into the press. The base of the billet is then subjected to an incomplete combustion flame to generate a thin layer of carbon. This layer prevents the press piston from sticking to it. The press closes, and a plunger begins to push the billet to the required pressure, according to the dimensions of

the profile, forcing it out through the mouth of the matrix. The high pressure to which the aluminum is subjected causes it to raise its temperature, gaining in malleability.
The main components of an extrusion installation are: the container where the extrusion billet is placed under pressure, the main piston cylinder that presses the material through the container, the die and the die holder.
From the extrusion and tempering process, a great deal of the mechanical characteristics of the profiles depend, as well as the quality in the finishes, especially in the anodized ones. Tempering, in an aluminum alloy, is produced by mechanical or thermal effect, creating structures and characteristic mechanical properties.

Extruded Finishing

As the extruded profiles leave the press through the die, they slide onto a bed where they are cooled by air or water, depending on their size and shape, as well as the characteristics of the alloy involved and the properties Required. To obtain straight aluminum profiles and remove any tension in the material, they are stretched. They are then cut into suitable lengths and artificially aged to achieve appropriate strength. Aging takes place in ovens at about 200 ° C and is in the oven for a period ranging from 4 to 8 hours. All this process is done in an automated way.

Temple Profiles

They are the thermal processes that increase the strength of aluminum. There are two quenching processes that are heat treatment in solution, and aging. T5 tempering is achieved by aging of the profiles passing to maturation furnaces, which maintain a certain temperature for a given time. Usually 185 ° C for 240 minutes for alloys family 6060, thus precipitating the silicon is achieved with the magnesium as magnesium silicide $_{(Mg2Si)}$ within the dendrites of aluminum, producing quenching of material. The extrusion output temperature of more than 510 ° C for alloys 6060 plus the correct cooling of the profiles to 250 ° C in less than four minutes is fundamental for the material to acquire its properties, this material is considered as tempering 4 or T4 or otherwise known as non-tempering.
Temper is measured by durometers, with the unit of measurement called Webster or Websters degrees.

Foundry

Casting of parts consists essentially of filling a mold with the amount of molten metal required by the dimensions of the part to be cast, so as to, after solidification, obtain the part having the size and shape of the mold.
There are three types of differentiated casting processes applied to aluminum:

- Casting on sand container
- Castong on metallic container
- By injection or pressure

In the casting process with sand mold the mold is made in sand consolidated by a manual or mechanical tamping machine around a mold, which is extracted before receiving the molten metal. The casting is then poured and when it solidifies, the mold is destroyed and the work is shot. This method of casting is usually chosen for the production of:

- Structural oversized parts
- Casting piece of aluminum

The cast in permanent metallic mold, serves to obtain greater productions. In this method the molten metal is poured into a permanent metal mold under gravity and under centrifugal pressure. It can be expensive, difficult or impossible to cast them by molding.
In the die-casting method, identical parts are melted at the maximum production rate by forcing the molten metal under high pressures in the metal molds.
By means of the suitable casting system, pieces can be melted, varying from small pieces of dental prosthesis, weighing grams, to large castings of machines of several tons, in a varied, simple or complicated way, which are impossible to manufacture by others Conventional processes such as forging, rolling, etc.
The casting process can be schematized as follows:

- Design of the original model of the piece to melt
- No elaboration or model type designed
- Fusion of the material to be melted
- Pouring into the mold

Characteristics of alloys for casting

Cast aluminum alloys have been developed because they provide ideal casting qualities, such as flowability and feedability, as well as values optimized for properties such as tensile strength, ductility and corrosion resistance. They differ greatly from forging alloys. Silicon in the range of 5 to 12% is the most important alloying element because it promotes increased melt flow. In smaller quantities magnesium, or copper is added in order to increase the strength of the pieces.

Machining

The machining of aluminum and its alloys in chip-cutting machine tools in general, is easy and fast and is giving way to a new conception of mechanization called generically fast machining. During chip removal, the shear forces occurring are considerably lower than those generated with steel (the strength required for the machining of aluminum is approximately 30% of that needed for machining steel). Consequently, the stresses on the tools and tools, as well as the energy consumed in the process, are less for the start of an equal volume of chip.
The concept of rapid tooling refers to that produced in modern machine tools Numerical Control with powerful and robust heads that allow them to rotate many thousands of

revolutions per minute until the order of 30,000 rpm, and work progress very large when is the machining of soft materials and very draining chip, as occurs in the manufacture of molds or major components of the aviation industry.
Aluminum has excellent characteristics of thermal conductivity, which is an important advantage, since it allows the heat generated in the machining dissipates quickly. Its low density makes the inertia forces on the rotating parts of aluminum (turnings) are also much lower than in other materials.
Occurs, however, the coefficient of friction between aluminum and metal cutting, by comparison with other metals, high. This coupled with its low resistance makes it behave like clay, can cause the dulling of the cutting edges, deteriorating the quality of the machined surface at low cutting speeds and even at high speeds with insufficient cooling. Whenever cooling in cutting enough, there is less tendency to clog with harder alloys with higher cutting speeds and angles greater detachment.
The development of rapid tooling allows many complex parts not being necessary to merge but are machined from prisms to which are performed all necessary emptying.
The rapid machining may represent a cost reduction of around 60%. In this type of rapid tooling becomes critical selection of tools and cutting parameters. The adoption of high-speed machining is a difficult process for the manufacturer, since it requires major changes in the plant, a costly investment in machinery and software, and a qualified staff training.

Aluminum corrosion

Metallic aluminum spontaneously is coated with a thin layer of oxide that prevents corrosion. However, this layer disappears in the presence of acids, particularly hydrochloric and perchloric; also in very alkaline solutions of potassium hydroxide (KOH) or sodium hydroxide (NaOH) a strong reaction occurs. The presence of $CuCl_2$ or $CuBr_2$ also destroys oxide and aluminum makes the strongly dissolve in water. Mercury and salts thereof, aluminum reacts if clear form an amalgam which prevents passivation. Also strongly reacts with bromine cold and hot with many substances, depending on the temperature, reducing to almost any oxide (thermite process). He is attacked by the haloalkanes. The reactions of aluminum often accompanied by light emission.
However, aluminum alloys behave quite worse than pure aluminum corrosion, especially if they carry annealing treatments, with which serious problems of intercrystalline corrosion and low voltages due to the microstructure presented in these states.

Toxicity

This metal was considered for many years as safe for humans. Because of this assumption they are massively produced aluminum cookware for cooking food, food packaging, and foil for packaging fresh foods. However, its impact on biological systems has been the subject of much controversy over the past decades and a profuse research has shown that it can produce adverse effects on plants, aquatic animals and humans.
Exposure to aluminum is usually not harmful, but exposure to high levels can cause serious health problems.

Exposure to aluminum is produced mainly when:

- Consuming drugs
- Aluminum powder is inhaled which is present in the work area
- Ingesting food prepared on aluminum surfaces

Anyone can become intoxicated with aluminum or its derivatives, but some people are more likely to develop aluminum toxicity.

Aluminum and soils

In some soils of the planet aluminum it tends to focus on the profile horizons, giving very specific characteristics. Of the eleven soil orders that are recognized by classification United States Department of Agriculture, two of them have a high concentration of aluminum: oxisols, which grow in tropical and subtropical latitudes and spodosols, which are in cold climates and under coniferous vegetation. In this type of soil nutrient content available to plants is low, only the magnesium can be abundant in some cases; besides its high aluminum content aggravates the problem because of its toxicity to plants. In tropical and subtropical regions where these soils occur it is usually grow plants with low nutritional needs and strong resistance to aluminum, such as tea, rubber and oil palm.

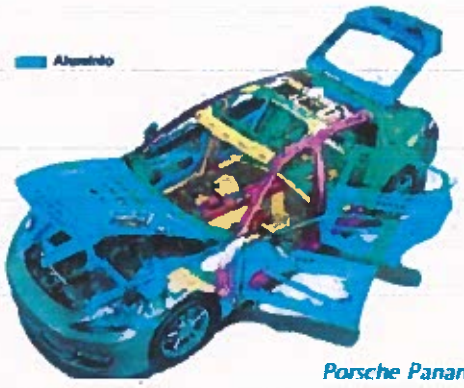
History of use of aluminum in automobiles

One of the first designs used an aluminum structure completely was built by a company called Bjerring Norway. Only they came to make four prototypes before Mr. Raufoss will take control of the company and try to transfer the advances developed by technology aluminum space frame design of cars and buses. This project could not be carried out by the lack of resources and technology (we're talking about the 30s). The first car manufactured using a body and all-aluminum structure was the Panhard Dyna, a prototype made in France in 1954. This vehicle was powered by a two-stroke engine but weighed only 629 kilograms and could lead to 6 people.
During the following years, new models like the AC Cobra Ace and combining spatial steel structure with a body formed by pieces of aluminum riveted on the structure, using a process called Super-Light that had been patented emerged. In 1999 he was presented at the Frankfurt an exhibition on aluminum promising developments, such as the Audi A8 made with the Space Frame technology, which will be explained later, and later applied to the Audi A2. This new technology is also being used by Mercedes (SLR), BMW (Z8) and Fiat (Multipla).

The current use of aluminum in automobiles

Automakers are many efforts to reduce the weight of their cars and therefore resort to the use of aluminum. But for these manufacturers is not only important weight reduction to

reduce gas emissions by need less gasoline, but to meet customer demand. Aluminum is a material that has begun to be used in vehicles of high performance, especially in engine blocks, cylinder heads, mechanical parts, radiators, this is because a few years ago aluminum was found only in exclusive models such as Ferrari, Jaguar, ... However, the use of this material in whole body is extrapolated to vehicles manufactured in series, such as: Audi A8, A2, R8, Mercedes SLS, Land Rover Defender. We also find vehicles that contain parts made of aluminum (bonnet, doors, wings, doors, roofs, tires, bumpers ...), vehicles assembled these pieces are: Audi A6, Renault Espace, Toyota Prius, Porsche Panamera, Range Rover.



Porsche Panamera

Alloys used in the car

Alloys are classified in forging and melting alloys.
Within these groups are classified into varieties. Aluminum alloys having copper as a component have high mechanical properties in strength refers, however, have poor stability against corrosion.

Aluminum alloys for forging

Variety Al-Cu-Mg: Is duralumin known. This material is hardenable. It has a resistance ranging from 18 kg / mm2 to 24 kg / mm2, untempered , and from 34 to 50 kg / mm2 to receive said heat treatment. Are used for mechanical parts subjected to extremely strong solicitations as can be: wheel hubs, known as alloy wheels, pulleys, sprockets crankshaft and camshaft, and certain body parts in some vehicles. Its resistance to corrosion is limited due to its copper content. By plating with pure aluminum or using special paints anticorrosion this effect can be mitigated.
Variety Al-Si-Mg: Also Quenchable thus reaching a resistance of 20-35 kg / mm2. Possess good stability against corrosion lending itself thus for automobile tires, frame parts and floor pan. For ease of polishing beautification slats they are also made.

Al-Mg range: Not hardenable. A growing Mg content increases its mechanical strength, 18 to 34 kg / mm2, also decreasing deformability and weldability. Heat resistance and corrosion resistance make it ideal for body parts, in building windows, etc .....
Variety Al-Zn-Cu: It is mainly used in engine bearings and bearing shells. They may also carry lead and magnesium in composition, thus, improve its mechanical properties as regards wear.

Aluminum alloys for fusion

Variety G-Al-Mg: This alloy is used for parts subjected to high heat such as air - cooled cylinder heads.
Variety G-Al-Si: Used to crankcases and gearboxes.
Variety G-Al-Si-Mg: They are ideal for heavily requested castings, such as cylinder heads and lightweight water - cooled engines.

In general, the current trend is to use these varieties of alloy by their ability to function perfectly, replacing cast iron and steels in parts not actually meet too important mission as casings, covers, housings, etc., having advantage of significantly reducing the unsprung weight of the vehicle, reducing consumption and allowing smaller sets forms. The unstoppable advance of technology causes light alloys are being replaced gradually by the previously mentioned synthetic parts, lighter and economic matters, which give better results.

Advantages and disadvantages of aluminum compared to steel
Advantage:

Greater fuel efficiency

The density of aluminum is one third of that of steel. This makes aluminum bodies are lighter than steel, and this note is primarily a better fuel efficiency. This is the case, for example, the Audi A2. Its body weighs only 150 kg., 40% less than a similar made of steel. Given that the weight contribution to the total body of the car is about 20% is observed that a reduction in weight quite important. This results in a reduction in emissions of 20%. That is why, for its lightness, so the new high-speed trains and even public transport are being made with aluminum structures.

Stronger, safer and better braking

Aluminum has a higher specific resistance than steel. At present, the fact of having more technology, aided by modern computer systems, makes possible the design and construction of a three-dimensional structure with a torsional rigidity by 40% higher than equivalent steel and 60% more light. In terms of structural efficiency, this makes aluminum structures are 96% more efficient than steel. As an example the Bugatti Royale, the most expensive car built, with its aluminum structure is capable of transporting a truck. Because of this lower body weight and that the center of gravity is lower in this way, the absorbed

energy in crashes and stopping distances are improved. Another example is the Audi A8, in a frontal crash tests gave the same results as another vehicle steel structure (considered very safe) for security, despite the advantage of much less.

Fewer parts for welding and greater corrosion resistance

The load ratio is divided by the various components of the structure. Therefore, each of the components need special characteristics for their manufacture. The pieces are developed processes that give a variable thickness (greater when better resistance and less is required if the component is not required in providing rigidity and is another function). For example, the body of the Audi A2 is composed of 240 pieces, more than double that in a welded steel body.

Recyclable

Aluminum can be recycled repeatedly without losing its qualities. Its high scrap value ensures recovery and recycling: currently 95% of the cars aluminum is collected and recycled, taking into account that 50% of the value of material from a car at the end of his life is aluminum. As for the pollution issue it is not clear. Manufacturing companies state that aluminum bodies using an aluminum body instead of a steel, you reduce the emission of carbon dioxide by 20% over the life of the car; while manufacturers of steel they say in a study, you'd have to be 32 years driving a vehicle aluminum to compare the level of CO2 emitted into the atmosphere by one of steel, due to the increased emission in the manufacturing process aluminum foils.

Disadvantages:

The high cost

A ton of aluminum costs about three times more than a ton of steel. This also adding a major plus in the final price of the car, affect repairs would be made throughout the existence of the car as it requires expensive welding techniques and handling.

Difficulty of working with aluminum

Its modulus of elasticity is one-third that of steel. For this reason, it can not be pressed or handled as easily as steel. It is also quite difficult to weld aluminum parts.

Mechanical properties of aluminum in the automotive use

Corrosion: The ease of reaction of aluminum with oxygen, makes is coated with an oxide layer called alumina, which protects the material from oxidation naturally. However, its use cannot be combined with materials of different electrochemical potential can be generated as galvanic corrosion processes with the result of the destruction of aluminum. So you should avoid contact of aluminum with steel coatings or adhesives.

Conformation: The comfortability of aluminum is better and easier to achieve than steel systems stamping, extrusion, forging, casting, machining and rolling with lower energy costs.

Repairability: The repair of aluminum is complicated because the plates are thicker and weaker than steel. This is because aluminum is less resistant to what is used to increase its thickness. Also when repairing aluminum must take special care that the tools are clean and free of chips from other materials, because if they are dirty can cause contamination of aluminum.

Weldability: For welding aluminum MIG welding with argon shielding gas and the filler material of the same alloy is used the area to be welded. It is also important to follow the manufacturer 's instructions, and to be welded at a specific temperature. All this makes aluminum welding is complicated and there are few professionals who have the appropriate knowledge to perform this type of work.

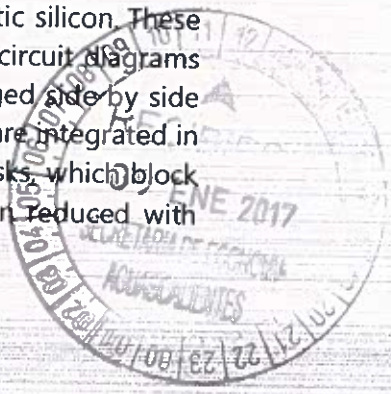
Comparison of aluminum on Steel

Propiedad		Aluminio	Acero 371
1	Esfuerzo (N/mm^2)	250	400
2	Elasticidad E, Módulo de Young (MPa)	70.000	210.000
3	Densidad (g/cm^3)	2,7	7,8
4	Punto de fusión (°C)	660	1500
5	Rango de temperatura de trabajo (°C)	-250 a 150	-50 a 500
6	Conductibilidad eléctrica $(m/Ohm\ mm)^2$	29	7
7	Conductividad térmica (W/m °C)	200	76
8	Coeficiente de expansión lineal x 10-6/°C	24	12
9	No-magnético	Sí	No
10	Tóxico	No	No
11	Resistente a la corrosión	Sí	Sí
12	Mecanizado	Fácil	Fácil
13	Maleable	Sí	Sí
14	Costo	Barato	Caro

Applications aluminum

Making microchip

The chips produced by the hundreds on a sheet of glass ultrapure synthetic silicon. These sheets are so thin they need about 10 to form a layer of 1mm thick. The circuit diagrams are prepared on computer and then reducing the size of the chip , arranged side by side on a glass plate called mask. Because the switches and other components are integrated in separate layers of the chip , a mask for each operation is made. These masks, which block the parts that are not needed, have several times the size chip , but then reduced with photographic techniques.



pono -type layers the insulating silicon-dioxide overlap and useless parts are chemically erased. This is accomplished by treating each layer with an ultraviolet light sensitive coating, placing a mask over and exposing to said light. Exposed parts become resistant to acid, and the unexposed parts are removed when applied.
Aluminum contacts and similar parts are deposited in vapor form in the areas recorded for them. When hardened aluminum, are added the circuit connections which make contact with fixed edges on the edges of the chip .
All chips finished being tested with delicate electrical probes to verify proper operation. About 70% are defective, so they are marked as rejected and discarded. After testing, each chip is separated from the cutter blade with a diamond tip under a microscope. The chips approved are mounted one by one in a box and covered with plastic. The contact surface is linked to connectors with fine gold wires, connected to these metal pins.

Heatsinks

Special heatsinks

A classic sink is a piece of aluminum extraction or folded sheet aluminum with mounting holes for the transistor or integrated circuit. But now the cost of aluminum invites solve the problem of heat dissipation by less orthodox methods that a priori seem expensive but end up being cheaper than traditional heat sinks dissipate when it comes to great powers.
An inexhaustible source of heat sinks are the cooler for PC. There you can find dissipating less than 0.5 ° C / W at very low prices due to the huge scale of production. Of course you should make a proper circuit to prevent a broken turbine burn an amplifier. But these turbines engines have coals because they function similar to a direct drive motors for video recorders or DVD brand some way. They also have three wires: ground 12V output frequency generator that can be used to recognize that the turbine is running. If these pulses disappear, the amplifier must be turned off because it was left without forced air cooling.
We all know that when an electric current by a real circuit heat is generated. But did you know that there are devices that generate cold when they are circulated by an electric current? Peltier effect cells are called and can work perfectly as heatsinks although his underperforming excessively enlarges the power supplies.

Peltier used the reverse effect discovered by a German physicist named Seebek: It took two wires of different metals, for example 1 meter long. He made a spot weld at each end of the pair. He puts one end into a mixture of water and ice to ensure a temperature of 0. He placed the other end into a kettle of boiling water (to ensure a temperature of 100 ° C).

When the welds take the temperature of the medium in which they are immersed, by wires will flow proportional to the current temperature difference. This effect is used in electronics calls thermocouples connected to a tester make it a thermometer.

wires sources of cold and heat are removed and circulates an electric current through the pair. One of the welds will be heated and the other will cool creating what is called a heat pump. In Figure 4 shows a commercial cell.

Shortly thereafter, the French Jean Charles Peltier discovered in 1834 the phenomenon can be called inverse. By passing a current through a circuit of two metals soldiers, one of the welds cooled while the other is heated, the system acting as a "heat pump".

Temperature Measurement}

If you were to measure the chip temperature of a power transistor amplifier complementary symmetry, there is no direct way to do that because the chip is not accessible, but there is a hint.
A silicon barrier has about 600 mV at 20 ° C, but the barrier is not set, the rate varies from - 2.5 mV / ° C approximately. If you connect the circuit base and emitter of a transistor with two keys in the normal arrangement or a tester needle to measure a barrier, you can measure the barrier cold and then hot and the difference get the temperature of the crystal by applying -2.5 coefficient mV / ° C.

Aluminum battery recharge cell in a minute

Scientists at Stanford University say they have invented a battery that can be charged completely in just a minute. Such a feat has been achieved through the use of aluminum and hope that in the future can replace traditional lithium batteries currently used in most laptops and mobile devices.
Speaking of The Journal Nature , professor of chemistry at Stanford University said that " This is an innovation that goes beyond what had been achieved in this area , " also he commented that "can replace batteries current in the future. "
The battery, which is still a prototype, is safer than lithium according to its creators, as it is less flammable and more respect for the environment that some alkaline batteries such as double and triple A.

It incorporates a voltage with an energy of 2 volts of electricity, being greater than 1.5 volts using alkaline. In addition, you can load up to 7,500 times without losing capacity, exceeding the previous batteries of the same type, which lasted about 1000 loads.

Another of the creators of this new invention, Ming Gonng commented that "another benefit is its flexibility, allowing bending, so can be adapted to future devices with such characteristics". Besides its price is lower than other chemical elements such as lithium.
One of the most demanded by users new features is the inclusion of more lasting batteries in mobile devices. Maybe these scientists have found the key and see this technology in future releases of the most prestigious brands.
Moreover, according to its inventors, the price will not be a problem: "Aluminum is cheaper than lithium metal".

ASUS Transformer Book Chi

This series comes in three versions: the 12.5-inch (T300 Chi), the 10.1-inch (T100 Chi) and 8.9 inches (T90 Chi). All have the ability to 'separate' the keyboard and become powerful tablets that work with Windows 8.1 or Windows 8.1 Pro operating systems. Its design is elegant (made from a single piece of aluminum) and extremely thin, more than Apple MacBook Air. Use screens with improved and ASUS IPS technology, thereby viewing angles with good gloss and clarity are obtained. They are already on sale in our country.

Metal alloys

These materials are a result of advances in both combinations of minerals as new processes. First is the control of the speed of cooling and solidification, which was achieved modify the microstructure of the materials and properties associated with them, as in the Zinalco, superalloys and high strength steels. With these controls higher strength materials to mechanical stress and different response to temperature are obtained, which implies greater efficiency and lifetime. On the other hand, is the reduction in weight; in this high-strength steels they have been a success, as they have impacted the construction and automotive industry. Although these materials are generally more expensive, more efficient machines let you, allowing for lower fuel consumption. This drop in fuel also adds a decrease of energy loss in casting, especially in the "glassy" can replace metals iron and silicon alloys in the manufacture of transformers.

Some of the alloys considered as new materials have as origin a group of metals that are not exactly new, but whose practical application is more recent. These metals are zirconium, hafnium or beryllium; used in nuclear, alone or as alloys engineering. Another group is dedicated to steelmaking as molybdenum, vanadium and tungsten. Apart from the metals used in nuclear engineering and steelmaking, there is a third group, consisting of light metals. Among the most diffused light metal is aluminum.

By developing electrolytic processes capable of producing pure aluminum at relatively low costs at the beginning of the century, it was possible that this metal, light and good electrical conductivity per unit weight, was successfully introduced in various productive sectors such as industry packaging, automotive , aerospace and manufacturing of electrical supplies, to name the most important. This success can also be attributed to the high degree of concentration of supply and its integration into the stages of production of consumer goods, as it facilitated the implementation of programs promoting and creating new uses and prevalence of stable and competitive prices, impacting metals such as iron, copper and tin. This concentration has been declining relatively and given to the pair of rising energy costs, which is one of the main inputs for obtaining aluminum negatively impacting its advantages. For example, the ratio between the prices of copper and aluminum rose from 2.69 in 1974, only 1.11 in 1984. Another lightweight metal is magnesium, which is mainly used in aluminum alloys, and as a structural material in the automotive industry.

I.2 Definition ACD and applications

ACD: compact aluminum degasser

What is a getter?

The **degasser** in a boiler refers to deaerator feed tank it. This tank has 3 main functions in a boiler:

1. Remove the oxygen dissolved.
2. Supply heated water
3. Supply boiling water to the tank

A degasser is a device that removes O2 (air) of boiler feed water (BFW) since oxygen is highly corrosive steam circuits.
Thermodynamically is a team that generates one or more equilibrium stages by placing a saturated solution of O2 and a stream of pure vapor contact. The chemical equilibrium shifts O2 of saturated liquid stream to the stream to comply with pure steam and (vap) = H * x (liq) (Henry or equivalent)

Why is it important to degas aluminum?

At the time of melting a piece of aluminum, machined surface appear tiny pores that not only disfigure its finish but also diminish the mechanical properties of the part. It is known that these small pores are caused by the **hydrogen gas**, which dissolves in the liquid the more aluminum is higher as the temperature of the melt. During cooling of the part, the dissolved hydrogen is released from aluminum as small bubbles that give rise to the pores.
Aluminum generally contains impurities of iron, silicon and magnesium, these impurities increase its hardness and strength, but decrease elongation.
Degassing the molten aluminum it is effected by a strong chlorinating within the melt. In large smelters chloridizing system introducing chlorine pressure through nozzles similarly to the oxidation process is used in converters. This process is complemented with a chlorinating treatment with nitrogen to remove residual chlorine.
A first way to alleviate the problem, is not excessively raise the temperature of the melt and avoid stirring the melt in the crucible. While aluminum is melting, it is formed on the surface of the casting of aluminum oxide layer that protects it from contact with air and hydrogen it may contain. If by shaking the break we will be favoring the aeration of the liquid and the dissolution of more hydrogen in it.
Reduce the temperature of the melt has a counterpart: in contact with the mold, the casting solidifies before entering every corner.
When removing the slag casting will be breaking its surface layer and thereby allowing more air and hydrogen get to it.
From the data collected it has been found that injection of nitrogen gas is capable of removing the hydrogen dissolved in the liquid aluminum and the crucible for melting furnace UCA optimum degassing time is 20 seconds. Crucible larger must be found

experimentally time optimum degassing, keep static the injection nozzle to avoid breaking the layer of aluminum oxide that forms on the metal surface and ensure that the nitrogen bubbles disturb as little as possible molten metal surface.

With demand for casting nonferrous increasing in volume, especially cast aluminum and aluminum alloy, there is also growing pressure to improve the quality of castings according to the technical specifications for most industrial applications, including construction, engineering, transportation, and the automotive industry where its use has increased rapidly in recent years. To remove impurities from molten to provide cleaning, better quality of metal, one of the most common and effective cleaning methods used by foundries is degassed by rotation.

With the increase in overall tonnage and quality demanded by cast aluminum, increasing globalization of the industry and increased competition among smelters, they must work with the process more efficient and more competitive cost to offer the best price its coladas on a global scale.

Theoretical principles

The impurities found in melted aluminum are mainly of two types: dissolved hydrogen and solid, non-metallic inclusions. The dissolved hydrogen comes out of solution as the metal cools, forming unwanted porosity. This porosity along nonmetallic solid inclusions reduces resistance and adversely affects the final properties of the castings resulting from aluminum.

Aluminum in a reaction occurs with the steam as follows:

$2\ Al + 3\ H_2O = Al_2O_3 + 3\ H_2$

Molecular hydrogen is then dissociates into molten metal:

$3H_2 = 6\ H$

The molten aluminum also interacts with atmospheric oxygen, in this way, in addition to seeing the oxidation reaction equation (a), the following reaction also occurs:

$4\ Al + 3\ O_2 = 2\ Al_2O_3$

Oxidation Resistance

This reaction results in a form of oxide layer on the surface of the molten metal during the casting process and subsequent transfer of molten metal. The oxides produced are trapped

in the bulk of the melt and are transferred to the melt end. Beyond the non-metallic inclusions such as carbides, nitrates or boronic can leave sources as the material of the crucible or other refractory materials.
Any inclusion produced lead defects in the structure of the casting and further, will have a detrimental effect on the mechanical properties also will lead to difficulties in machining and possible impairment of machining tools. It is thus essential to remove dissolved hydrogen and non-metallic inclusions from the molten metal with the highest priority for optimum quality. The treatment has been developed to clean the metal is a physical process that involves a flow of inert gas. The hydrogen which is dissolved in the molten metal diffuses into bubbles ascending gas flow and transported to the surface of the melt, this process depends on two main steps:

1. Speed of diffusion of the hydrogen through the diffusion of the layers bordering in bubbles of gas inert.
2. Concentration of hydrogen in the bubbles of gas inert.

Broadcasting is the proportion that determines the level in the degassing, therefore, them following requirements are necessary for an optimal efficiency in the degasser:
1. Small size of the bubbles of gas inert with a long e insistent duration in the metal cast. This ensures a great surface of contact between the bubbles of gas inert and the metal cast and therefore a high coefficient of mass transferred on the layer of diffusion.
2. As a result, a wide distribution of bubbles of inert gas over the complete cross section of melted material.
3. Adequate mobility of melted material, which accelerates the transport of hydrogen the inert gas bubbles.
4. An inactive area of the bath of molten material to avoid the absorption of hydrogen in its reaction with the atmosphere.

Oxide and other nonmetallic inclusions are removed mainly by flotation as small bubbles of inert gas them together same oxides and float to the bath surface. The principles applied in the removal of hydrogen also apply to the removal of oxides.

Molten Metal Purification

Aluminum smelters have been warned of the need for an effective treatment gas flow to remove hydrogen and inclusions. Thus, recent improvements have been developed to complete these requirements and achieve the best possible efficiency degassing. The major breakthrough in automatic, efficient, cost effective comes with the development of the rotary degasser. The main of these machines requiring rotor, is that very fine bubbles can generate inert gas also consistently distributed throughout the metal bath.
Technique degasser rotary eliminates these undesirable components by bubbling gas, usually nitrogen, through the molten metal. This gas is usually performed by a rotary degasifying, which reduces the size of the bubbles and disperses nitrogen through the molten metal bath. As a result of the rise to the surface of the gas bubbles through the

mass of molten metal, they absorb hydrogen dissolved in the metal and removed from the casting.
Additionally, the solid particles of non-metallic material are swept to the surface by flotation effect created by the bubbles and can then be removed.
The uses of aluminum are usually to produce quality products.

ACD: compact aluminum degasser

The ACD / compact aluminum getter is a multi-stage, in-line sealing equipment processing rotary degassing molten aluminum by rotating nozzles directly into the sprue between the furnace and the casting pit.
The ACD is much smaller and more flexible than conventional getters online (boxes lined with refractory steel). Although the physical, mechanical and operational differences between the ACD and conventional degassers are significant metallurgical underlying principles involved in treating metals are the same. Therefore, the metallurgical performance is equivalent or even superior to conventional online degasser.
The ACD is also easier to operate and maintain than any other getter. Since no metal retention in the machine at the end of a mold, changes are much easier alloy, and no heating is required.

Key Features:

Improving the quality of metal

- High efficience hydrogen.
- Eliminates to alkalis and inclusions when used n of chlorine or a salt flux.

Improved productivity

- It works in sealed mode; very little formation or n slag.
- Eliminates loss of metal due to changes in alloy.
- Eliminates the need to maintain the molten aluminum.
- Friendly operator; fully automatic.

Low operating and maintenance costs

- Eliminates heating elements and thermocouples or n high cost.
- Eliminates high cost refractory lining.
- Reduces energy consumption i a.
- Reduces downtime foundry or n for maintenance.
- It reduces overall costs of operation or ny maintenance by 60%.

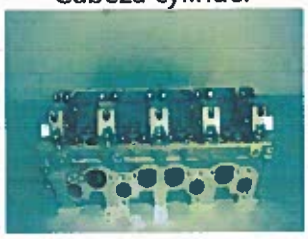
safe working environment

- Elimination or n chlorine, if necessary, to trav é s usage FFD / Flux feeder degasser.

Products made of this material

- Equipment and machinery that are made entirely with this material
- Parts for equipment and machinery

Cabeza cylinder



Monoblock

Chips

Trays

Using ACD aluminum products in the semiconductor industry (worldwide)

It is mainly used in devices transfer parts bearing an extruded process.

Main countries from which these products are imported

Malaysia, Japan, China and India.

II.overall objective of the study

Identify demand for aluminum products ACD in electronics and electronic components industry in Mexico.

III.An to analysis of the technological environment or logical

III.1 International

National

III.2
Aluminum, a metal of technological interest

Currently aluminum, iron, copper and zinc are the four metals more employees. The application possibilities of a material depend, among others, economic, environmental,

technological factors and, of course, their physical and chemical properties. For example, compared with iron, aluminum is a less dense metal, "lighter" and more corrosion resistant. This is manifested, for example, in the application of aluminum in air navigation.
Aluminium has other interesting properties: its low melting point facilitates the process of melting and subsequent solidification, and also forms stable alloys with other metals such as zinc (zincalum).
Industrially aluminum obtained from bauxite by Bayer and Hall-Heroult process can be processed into a wide range of products. The company Aluar, located in Puerto Madryn, produces metal. A visit to the company catalog illustrates the diversity of products of pure aluminum or alloys commercially available. Among its many applications, they include: transport and distribution of electricity (cables, pylons), food packaging and medical, aerospace industry, building material (metalwork), pipes for irrigation systems, heating, cooling , etc.

Aluminum, the metal that aims to end the reign of copper

When the price of copper, aluminum value remains unchanged and its production rose to 47.3 million.
Between 2006 and 2010 when the price of copper began to climb up to its historical limits, the industry generally was very alarmed, its dependence on copper made strove to find a replacement for lower cost, finding the aluminum one alternative.
Despite recent declines in the price of copper registered between last year and this, over the last twelve years, the price of copper has more than quadrupled from US $ 1,483 to US $ 7,125 per ton for deliveries to three months on the London Metal Exchange. Aluminum, meanwhile, has barely budged and when it falls it does in the same proportion as copper. Copper prices quadrupled in this period, although the production of the metal has not even doubled. The world produced 13.2 million metric tons of copper in 2000 and 17.9 million in 2013.
While global copper production was not increased, yes it did aluminum, demonstrating the growing interest of markets for this metal in all fields, in the very own and that of copper. In 2000, world production of aluminum was 24 million metric tons; fourteen years later, the figure reported by the United States Geological Survey was almost double: 47.3 million.
For 2011, Alcoa global cable manufacturer, indicated that aluminum had already replaced two percent of the copper market, which meant about four hundred twenty-five thousand metric tons. The tendency was to get a percentage of up to 10% in five years.

But you can beat aluminum to copper?

The kingdom is the conductivity copper and digital communication, although it is also found in the architecture, as a decorative metal, is still the favorite metal for essentially counted attributes. By its ductility, and heat transports electrons. There is only one metal in this task better than copper and silver, but is more expensive. Scientists have found him more copper property: its antiseptic, antimicrobial capacity. Copper becomes difficult climbing wall for some fungi, bacteria, yeast and viruses. For this copper it is also present in fungicides in horseshoes and toothpaste.

Aluminum, obtained from bauxite, which is its only major source is present in beer cans and deodorants, in medicines for heartburn and aspirin, in kitchen utensils and even flour, in engines BMW, in Bentley cars, Rolls Royce, on airplanes; in certain professional fields, this element, color and similar to those of silver glitter, beats by much copper. Aerospace engineers implement prefer aluminum instead of copper communication satellites will soon be launched into outer space and into orbit.

Aluminum has removed copper participation in markets power cables, electrical equipment, automobile radiators and air conditioning systems; titanium and steel in the market of heat transfer; fiber optics, telecommunications and plastic, potable water and sewerage.

To the future of conductivity, is believed to happen only one: either copper or aluminum, but not both together. Except the price, aluminum has everything against. Being softer than copper, aluminum wires are deformed more easily. Aluminum melts at a lower temperature (660 ° C) than copper (1083 ° C). Likewise, there is a considerable difference in the conductivity.

If copper pass road hundred electrons per second, by a similar diameter aluminum only sixty. However, the differences may be only temporary. Researchers at the University of Munich, along with BMW, studying ways to make aluminum so good as to the transmission of heat and electricity as copper. Aluminum is winning market overhead wiring because it is three times less heavy, but needed to enough material to isolate.

Meanwhile in Russia, scientists from the National University of Technological Research in Moscow, working on new material: with the help of nanotubes and nanospheres boron nitride coated aluminum attempt of the characteristics of steel. So the aluminum may also demolishing steel finish. In this world nothing can be taken for granted, so soon global demand requires copper, wait (for the sake of Peru) for many years.

Use of pure aluminum in the Automotive Industry

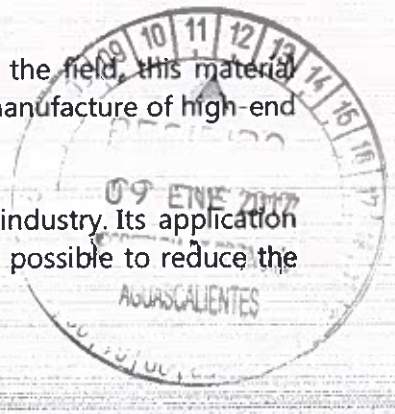
The automotive industry is one of the industries most benefited by the use of aluminum, because the use of steel can become cheaper is no longer required, but that the quantities used in the manufacture of car turns out to be more expensive than aluminum.
Keep in mind that aluminum is more malleable and more effective than other metals, as being lighter is better models, faster, dynamic and secure.
Aluminum has only one third of the density of iron alloys but may be stronger than steel, while having desirable properties such as machinability and casting, and corrosion resistance properties. The use of aluminum exceeds that of any other metal except iron, and it is important in virtually all segments of the world economy.
Its uses are too numerous to list. Earlier this century, chemists were able to improve the production of aluminum, which lowered its cost so that enabled its widespread use. So we can have in our kitchens, pots, pans and aluminum cookware. But this metal has other more important uses: suffice it to say that over 60% of the weight of an aircraft constitute combinations of aluminum, such as duralumin, which makes it as strong as steel, with the advantage of being three times lighter. In addition, it comes in various proportions in the manufacture of toys, appliances and machines for industry and household goods, furniture, equipment, tools, etc. Such is their prevalence in modern industry that currently ranks third among the metals from the point of view of the amounts employed.
Aluminum is a metal that has a number of excellent mechanical properties within the group of non-ferrous metals, hence its heavy use in industry. Within the life cycle of aluminum, it is currently at the stage of maturity, ie their production is stabilized for a couple of decades ago, but in the automotive industry use is increasing.
It is a pure soft, greyish and low density metal. Aluminum is ductile and malleable but close to its melting point temperature becomes brittle. It is a good conductor of heat and electricity (hence its use for cables high voltage electrical lines).
Aluminum is a strongly electropositive metal and highly reactive. Moist air it tarnishes slightly as it is covered with a thin and compact oxide layer insulates and prevents further reacting. Therefore, materials made of aluminum do not rust.
Recent developments aluminum body allow more light and safe parts.

The automotive industry in the future

Recent advances in technology developed in the automotive industry due to the recent addition of aluminum for body building advanced.

From various studies by engineers and specialized researchers in the field, this material began to be used not only in mechanical components, but in the manufacture of high-end cars.

After steel, aluminum is the metal most used in the automotive industry. Its application thanks to its rigidity and low weight became widespread as it was possible to reduce the



weight of vehicles by 40%. In turn, this led to excellent results in weight-velocity relationship.
Most local market cars have rolled steel bodies. While there are cars that combine steel and aluminum in different parts, so far the total use of aluminum is only seen in high-end vehicles.

The innovative application of aluminum in the automotive industry due to their advantageous properties with respect to steel. Besides being a malleable material, even at low temperatures, aluminum has a higher mechanical and elastic strength.

Other advantages of aluminum in automobiles:

- It is reusable almost unlimitedly, which prevents waste and protect the environment. In addition to s, its use helps to reduce emissions.
- Reduces fuel consumption by 0.5 liter per 100 km. approximately. The BODY í as are made of aluminum m to Mr. í tected than steel, and feature elements Strain or n capable of dissipating much of the energy í to an impact.

Aluminum, savings for automotive

The use of this material would reduce costs for consumers at $ 3,000; Industrial noted that about 10% of a vehicle body is constructed with aluminum.
If automakers will use more aluminum and less steel in hybrid and electric vehicles could reduce the cost to consumers at $ 3,000 per vehicle, said a report backed by the aluminum industry.
"As automakers prepare for a new generation of electric-powered vehicles, the high cost of battery power remains a barrier," said Michael Bull, director of Automotive Technology manufacturer of aluminum products Novelis, Inc.
"Improving a traditional steel structure to a body of advanced aluminum, the requirements of energy stored in the vehicle can be cut by about 10%, which could save up to $ 3,000 per vehicle since less power and energy required to move the lighter vehicle, "Bull said.
Executive comments were prepared for delivery Tuesday at a conference at the Center for Automotive Research (CAR acronym) in Detroit.
Bull, who represents the Aluminum Association at the conference, told Reuters at another conference that currently about 10% of a vehicle body is constructed of aluminum and the rest is made of steel. The average weight is between about 2,400 and about 2,600 kilos kilos.
There is a universal recognition, he said, that making cars and light trucks increases fuel efficiency and reduces costs by reducing battery power requirements.
"The solution lies in reducing vehicle weight with aluminum as part of a comprehensive approach to also include advanced transmission and batteries, improved thermal management and aerodynamics and reduced rolling resistance," Bull said.

The report by a consulting technical research to the Aluminum Association, said making lighter vehicles, with more aluminum, increase management autonomy.
"Reduce the mass of the vehicle 20%, 20% will go further," he said. "As with conventional vehicles, the lighter vehicles have faster accelerations."
He cited Tesla Motors Roadster, the luxury vehicle Fisker Automotive and Bright Automotive's van, all platforms using lightweight aluminum for their vehicles.
"Many of today's hybrid vehicles are progressively adding lower weight components to improve overall vehicle performance," said the report, financed by aluminum producers Alcoa Inc., Novelis Hindalco Industries, Inc. of Rio Tinto Alcan, Kaiser Aluminum Corp and others.
Aluminum is making a "steady penetration" in the automotive market, "and if we could reach a point where 10% of the vehicles are completely of aluminum, would be happy," Bull told Reuters.

VW says no to aluminum in vehicles

Volkswagen AG is using a new highstrength steel to make cars lighter and meet strict emission standards, contrary to the forecasts suggest that aluminum is the metal chosen to reduce the weight of vehicles.
The use of the material, which is up to six times stronger than conventional steel, has helped the second largest automaker in the world to reduce vehicle weight by about 100 kilos, which generates more fuel efficiency and less pollution.
Aluminum has approximately one third the weight of conventional steel but costs are three times higher.
" Volkswagen is using high strength steel in increasing amounts. It is a very cost effective way to reduce weight , " said Armin Plath, head of research in materials and workmanship VW in an interview with Reuters.
Plath said that VW has quadrupled the amount of high-strength steel used in its model Golf.
Meanwhile, VW spokesman Christian Buhlmann said that costs are the most important factor in choosing the material.
"By using new innovations in steel engineering (...) I can reduce weight without the use of more expensive, such as aluminum and carbon fiber materials," he said.
The 5000 series aluminum alloy used in cars costs about $ 3,500 a ton, while the price of high-strength steel is around $ 1,000 per tonne, experts say.
Plath refused to comment on whether the decision to use steel VW was influenced by the long waits to access the aluminum in warehouses registered with the London Metal Exchange (LME, for its acronym in English).

Future materials

The use of aluminum has increased, almost tripling in European cars about 140 kilos per vehicle from only 50 kilos in 1990, according to the European Aluminium Association.

Most of the aluminum is in the chassis, engine, suspension and transmission, not on the car body.
The amount of aluminum per vehicle in Europe could increase to 180 kilos in 2020, according to a study last year by the consulting Drucker Worldwide.
So far, the increased use of aluminum has been in high-priced vehicles like the Jaguar and Mercedes, where costs of raw materials are a minor problem.
While Volkswagen has used steel to reduce the weight of their massive models, the pressure for greater decrease in weight generate the firm to use more expensive materials in the future, Plath said.
"If you want to go beyond what is currently possible, then maybe you will need to use other materials such as aluminum and fiber reinforced plastic," he added.

Automotive and Transportation

During the last decade the use of aluminum in the automotive industry has increased steadily, absorbing more than a quarter of the aluminum produced.
Currently manufactured aluminum parts such as pistons, engine housings, wheels, gearboxes, anti-lock systems, brakes, suspension assembly, shock absorbers and heat exchangers for air conditioning systems, radiators, structures and bodies among others.
The use of this material involves major environmental advantages: the lightness of the material is a vehicle weight reduction of up to 30%, which translates into fuel savings. In terms of recyclability, more than 95% of the aluminum contained in automobiles is recovered and recycled.

Print Features

Unity	Thickness		Width		Length		diameter internal		diameter external	Weight	Alloy
	min	max	min	max	min	max	min	max	max	max	
Roll and Tape											
inches	0.008	0.134	1	12	-	-	16	twenty	47	1.700 Lb	1XXX, 3X〉 5XXX
mm	0.2	3.4	25	305	-	-	406	508	1,200	800 kg	
Natural leaf											
inches	0.008	0.165	Referring to Fig.	1,220	14	144	-	-	-	-	1XXX, 3X〉 5XXX
mm	0.2	4.2	200	59	350	3,660	-	-	-	-	
Graffiti Print											
inches	0.018	0.157	2	29	-	-	16	twenty	71	4,000	1XXX, 3X〉

											Lb	5XXX
mm	0.45	4.0	54	1,500 -	-	406	508	1,800	1,800 kg			

"The automotive and aerospace industry are more interested in using titanium"

Sam Froes is a world eminence in the field of metallurgy, mainly in the synthesis, characterization and testing of titanium alloys, magnesium and aluminum for the transportation industry. British by birth, Froes has spent much of his career in the US and is currently the director of the Institute for Advanced Materials and Processes at the University of Idaho. It has more than 800 articles published in scientific journals of high impact index, it has registered some 60 patents and has written 27 books. Degree in Physical Metallurgy from the University of Liverpool, Froes doctorate from the University of Sheffield and after working for almost ten years in a company dedicated to steel and many others in the study group titanium alloys of the US Air Force, I continue his career in the academic level.

Aluminum, titanium, magnesium ... are old acquaintances in the industry, what new properties are discovering that their applications are multiplying today?

The reason for using titanium, magnesium or aluminum in the transportation industry is because they weigh less than steel and as you reduce the weight of a car or an airplane the scope of these advanced materials opens. Specifically, the biggest challenge studies with titanium is to reduce costs, because it is a very expensive material. The airline industry is expanding the use of this material, such as the Boeing 777 and the new aircraft which has just been produced, the Boeing 787, the Dreamliner, containing 18% titanium, a reduced amount of aluminum is being replaced by composites of organic polymers and virtually no magnesium. This industry is reluctant to use because magnesium has low corrosion resistance and can ignite but, however, it is being used increasingly in the automotive industry. For example, the Volkswagen brand is produced with this material many components, especially those with complicated shapes, such as seat frames or structure of the flyers.

You are specialized in the area of transport from the point of view of materials why are so appropriate for this sector which these alloys?

These new titanium alloys have to meet certain mechanical properties of resistance to the stresses applied. Titanium has a higher level of resistance without deformation than aluminum and magnesium. Therefore, both the automotive industry and aerospace are interested in using more titanium for its combination of lighter resistance and lightness that the steel- what directly affects the amount of fuel needed, but has a big problem: its high price. Today, a lot of research is aimed directly at reducing costs titanium using what we call "near net shape aproaches", ie we try to produce shapes with curved portions and

small-like gears or wheels instead of producing large metal plates on which the industrial machinery make the configuration, since such machines are quite expensive.

What kind of titanium alloys work?

We try to reproduce the same microstructures instead of producing different 'nanostructures'. Most titanium alloys are formed from 6% aluminum and 4% vanadium on. There is some research trying to replace vanadium iron, which is a much cheaper material, but this has not yet produced much. In the alloys with the introduction of these substitutions of elements, we always try to maintain the same mechanical properties or, if we can improve them.

When you are trying to design these forms with titanium alloys, what are the biggest problems they face?

The most complicated parts are internal geometries, the most intricate. For the automobile industry we are building different pieces, such as valves for car engines. Also they are being used in exhaust systems, exhaust pipes, using materials plates and springs, spring type, which are two good applications that are used today.

Today famous architects such as Frank O. Gehry, for example, are beginning to use materials that have not been traditionally used in this field. Are you interested in this topic?

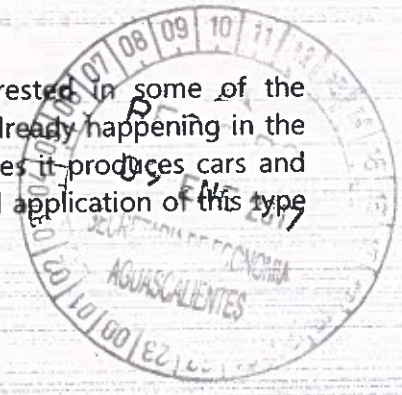
Actually this is a very simple goal: they use commercially pure titanium basically buy plates of pure material and then together in certain ways. In fact, in these cases there is a challenge in terms of microstructure or physical properties of materials.

What do you think is the future of lightweight materials, particularly of new titanium alloys?

Everything depends on the price. As it is reduced greatly extend applications. For example applications in cars are very important because every year are taking some 50 million cars worldwide, so if it were to be used only one kilogram of titanium in each the total amount of titanium is currently hiring would double .

How is the relationship with industry?

Laboratory-scale work but we hope that the industry is interested in some of the techniques and alloys developed for use commercially, which is already happening in the automotive industry. Toyota, for example, uses half titanium valves it produces cars and other brands used in the exhaust pipes and springs. The industrial application of this type of alloy is already starting to happen.



Do these materials many requirements when it can be used *in situ* , on a plane or in a car?

Yes, particularly in the case of aerospace materials have to meet certain chemical requirements and certain values in their mechanical properties. In the automotive industry it has not yet defined what properties are those that have to meet, because it is still a young application. In any case, the restrictions need the parts we are doing for the automotive part are less stringent than those we developed for the aerospace. Alloys for the aerospace and automotive industry are a major challenge for the properties of materials and cost reduction, respectively. Both are extremely interesting.

In the case of biomaterials, which are already used in the hip, knees or teeth, can I titanium alloys also serve as biomaterials?

Qualifications needed materials to be applied to the human body are even more stringent than for the aerospace industry. It takes at least ten years to qualify a material so that it can be used in the human body. For example, titanium alloys are only about two being used as implants in the human body, are the titanium with 6% aluminum and 4% vanadium and titanium with 7% aluminum and 5% niobium.

Technological advances Aluminum

The science of metal 13

Aluminum: Item 13 - Atomic Weight: 26.9827.
Aluminum has 13 electrons orbiting its nucleus. This metal belongs to the boron group and is known for its strength and light weight. It is nonmagnetic and resists oxidation. Aluminum is difficult to ignite, however, has a high energy density. The aluminum powder is used as the main fuel for solid fuel rockets: the space shuttle. Aluminium reflects 92% of visible light and UV light. Because it is highly conductive and lightweight aluminum is used to produce most of the wiring for electricity transmission networks in the country.

Aluminum recycling

The aluminum can be recycled continuously without loss of its qualities. Recycling saves 95% of energy production necessary to create it through casting processes.
The aluminum industry pays more than $ 800 million for the recycled material, and every minute an average of 113,000 aluminum cans are recycled. School programs for recycling can make a difference.
Aluminum is used in hundreds of industries: Transportation, aerospace, packaging and construction. The industry directly create more than 155,000 jobs. In total, 672,000 US jobs arising from production, processing and use of aluminum.

Aluminum recycling creates economic value

Recycling aluminum saves more than 90% of energy costs required in primary production. It is 100% recyclable. Recycled aluminum retains its properties indefinitely.
The recycling industry has grown considerably and is profitable. Over 70% of the aluminum produced from the start of the recycling industry has been and is in use today.
Each year, the aluminum industry pays over $ 800 million dollars for empty aluminum cans. Every minute 113,000 aluminum cans are recycled. Aluminum recycling has allowed charitable organizations and groups to earn money to support programs and projects for decades.
It is noteworthy that the impact has been recycling aluminum in the environment. 75% of all aluminum produced is still in use. The production of recycled aluminum requires only 8% of energy and creates emissions by 8% compared to primary production. As more companies seek energy saving innovations in its products and manufacturing methods, the aluminum industry is poised for even greater success.
A recycled can today can be back on the market within 60 days. Aluminum cans unopened are very strong, despite being so thin. Four packages of six cans are capable of withstanding the weight of a vehicle of 2 tons!
Every three months, Americans throw away enough aluminum scrap to rebuild the entire fleet of commercial aircraft in the United States. Recycling of this metal would save the energy equivalent of 16 million barrels of oil.
Aluminum is the true metal of modern life.

International Business

Aluminum production is a global industry. Bauxite ore is mined in places like Australia, China and Africa. Alumina plants operating around the world, including in Russia and Eastern Europe. Aluminum products are manufactured and shipped worldwide. International aluminum industry creates careers in finance, operations, IT and management worldwide.

Science and Research

Aluminium is at the forefront of technology. They are conducting research to produce an aluminum-air battery to power an electric car 1,000 miles. Nanoparticle research plans to create advances in the design of the power cell and solar nano-circuits. The new Orion spacecraft NASA uses an aluminum alloy to form its primary structure, and the transparent aluminum is advancing in military armor.

Aluminum can be fun stuff

The aluminum powder is normally used to make fireworks. Solid propellant rockets, including rocket engines of the space shuttle, use aluminum as its primary fuel. Etch-A-Sketches uses aluminum powder in the back of their screens. Glitter liquid paint and metal are made of aluminum pigments.

Economic impact of aluminum

In addition, the economic activities of the aluminum industry make contributions to other market sectors (transport, packaging, construction, engineering and others).
The aluminum industry contributes more than $ 152 billion to the US economy, almost 1% of GDP. Generates 67,000 direct jobs. Technological advances in the aluminum industry increase trade and competitive advantages of US companies. The aluminum industry offers its customers to compete and win hundreds of technology industries.
The aluminum industry generates more than $ 16 billion a year in federal, state and local taxes. More than 4,100 facilities are in operation: production of alumina, primary aluminum, secondary aluminum, semi-manufacturing, wholesale and metal services.
The demand for aluminum is almost 30% since 2009, due to increasing interest in products with low energy consumption and production processes. Its recyclable aluminum and light qualities are attracting new markets: Consumer electronics.

General information and innovations aluminum

Before the discovery of the processes of Bayer and Hall-Heroult, aluminum was more expensive than gold or silver. Napoleon III state dinners served in aluminum plates.
The Wright brothers used to build aluminum engine key parts of his biplane.
Lightweight, durable and infinitely recyclable, aluminum has become an essential element of daily life. Since sustainable material of choice, applications ranging from everyday items as fuel-efficient vehicles, smart phones, zippers and foil for wiring the power grid of the nation, the top of the Washington Monument and housing the International Space Station.
Aluminum cans allow cool quickly and protect the flavor and integrity of our favorite drinks. Coors pioneered the use of aluminum cans in 1959.

Versatile

Aluminum is considered a "miracle metal", and for good reason. His long list of properties: light, corrosion resistant, easily trained, highly conductive, highly reflective, non-toxic and recyclable, offers manufacturers and designers a wide range of options for product innovation and process improvements. By virtue of its strength and beauty, aluminum is also the backbone and the facade of the remarkable buildings around the world.

Sustainable

The use of aluminum reduces energy costs and carbon emissions in dozens of applications. Recycling and lightweight aluminum packaging reduces shipping costs and emissions, while an aluminum intensive vehicle can achieve a 32% reduction in energy consumption over its lifetime. The aluminum industry in North America will soon reach a point where more energy than it consumes exclusively by the impact of light commercial vehicles weighting becomes.

Mobility for the modern world

Aluminum has an increasingly important role. The transportation industry has always been based on light weight and durability of aluminum to improve safety and increase fuel efficiency. Conquering the air and space travel would not be possible without the aluminum, as even the Wright brothers knew when selecting an aluminum engine for the first flight. And now the digital world are realizing the benefits of aluminum for both product design and manufacturing efficiency. Laptops everywhere, smartphones and tablet are the ultimate showcase of modern metal.

Industries and markets

For heavy industrial markets, aluminum is durable, strong, corrosion-resistant, which is also lightweight and easily formed material. Transport companies and aerospace can create innovative products without sacrificing safety or performance. In consumer applications, manufacturers value light properties of aluminum to reduce transportation costs and their visual appearance to create attractive designs. In all sectors, the infinite recyclability of aluminum is compatible with sustainable manufacturing and positive environmental objectives of the nation contribution.

Future challenges and opportunities

Although much has been achieved, the United States still has a great opportunity to reduce their energy consumption and carbon footprint. And the pressure comes not only from government and environmental groups. Consumers increasingly looking to buy companies with a strong sense of corporate responsibility and a strong environmental record. Innovative companies such as Ford and Apple, are turning to aluminum to help make products that delight customers.

Virtually everyone in the United States, and indeed most of the world uses aluminum daily. The metal is so pervasive that many of us do not even realize how often that touches our lives. In fact, people use more aluminum than at any time in its 125-year history in the commercial production of the metal. Aluminum is fundamental to modern mobility and connectivity, and without it, many of the comforts of today's world simply would not exist.

Innovative applications of aluminum are all around us. The car you drive to get to work most likely has an aluminum hood and other lightweight parts to boost fuel efficiency. Your home or office building probably uses aluminum windows and doors, or maybe even a cold roof to improve insulation and reduce heating and cooling bills. That plane in which you fly on summer vacation or business trip, literally not be possible without light aluminum as a key component. Increasingly, even high-tech gadgets they use to keep in touch with friends and family make use of elegant and attractive aluminum enclosures.

Aluminum is the essential element of modern life

Building construction

Aluminum was used for the first time in construction in the 1920s Applications are mainly oriented towards decorative details and art deco structures. The breakthrough came in 1930, when the main structures within the Empire State Building were built with aluminum (including interior structures and the famous tower). Today, aluminum is recognized as one of the materials most energy efficient and sustainable construction. It is estimated that 85% of the aluminum used in buildings today comes from recycled material. Buildings with LEED certification intensive aluminum have won awards Platinum, Gold and the best sustainability throughout the country.

Other markets

Since the introduction of aluminum in major US markets in early 1900, the scope of this metal has grown exponentially. As aluminum enters its second century of widespread use, new scientific and production technologies continue to expand its potential market. Nanotechnology, solar panel, aluminum alloys and transparent aluminum-air batteries will help pave the way for the development of new and innovative markets in the XXI century.

Looking to the Future: Aluminum Particle Technology

Compared with gold or silver, aluminum nanostructures show optical resonances in a cross-largest region of the spectrum. Research now indicates that aluminum nanoparticle technology may be the best candidate for solar energy for harvesting and other optical devices large area. (They would be too expensive to produce with other elementary and precious metals.)

The history of aluminum foil

The first production of aluminum foil occurred in France in 1903. In 1911, Tobler based in Switzerland, Bern, began wrapping its chocolate bars in aluminum foil. Its unique triangular bar, Toblerone is sold in 122 countries worldwide.
The production of aluminum foil in the United States began in 1913. The first commercial use: packaging of Life Savers in its shiny metal tube now world famous. The demand for aluminum foil skyrocketed during World War II. Military applications included the use of strips of aluminum foil in shelling, to confuse and divert radar tracking systems. In many cities, the aluminum foil balls collected could be redeemed for free entrance to a movie theater. One of the most innovative uses of aluminum foil occurred in the 1960s. Wire branches and ornaments debuted foil Christmas tree full aluminum.
The foil has a shiny side and a dull side. The bright side is produced when aluminum is rolled in the last pass. It is difficult to produce rolls with a thin enough space to roll a single sheet of aluminum foil. For the final pass, two leaves are rolled simultaneously, doubling

the thickness of the roll. When the sheets are separated later, the two inner surfaces are matt and glossy are two outer surfaces.

Packaging

The origin of the foil can be traced to early 1900. The Life Savers, one of the most popular candies today were packaged in foil in 1913. Today wrapped in a tube of aluminum foil fame world. The uses of aluminum foil have grown in the last 100 years to an almost infinite count. From Christmas trees to the isolation of spacecraft, uses TV, etc., use that has aluminum foil, in many respects, improved products and our lives.

Effective energy conservation

The "bright" side of the foil is 88% reflection, which is one of the best and most efficient insulation to solar heat.

Billions of containers are produced each year

Approximately 7 billion aluminum foil containers are produced annually. It is requiring production of 220 containers per second.

Growth foil and packaging market

The first preformed packaging containers of food, all aluminum, appeared on the market in 1948. A period of spectacular growth occurred in the 1950s and 1960s Packed in compartmentalized trays, began to form the new food market . The wrapping paper is now divided into three broad categories: home / institutional, semi-rigid packaging and flexible packaging aluminum. For decades, the use of foil has grown steadily in each of these categories manner.

Food Preparation: The foil is "dual ovenable" and can be used both in convection ovens and airy. A popular use of the cover sheet is thinner sections of poultry and meat to avoid overcooking. The USDA also offers recommendations on limited foil in microwave ovens uses.
Insulation: The foil is 88% reflection and widely used for thermal insulation, heat exchanges and cable coatings.
Electronics: In electrical capacitors offers compact storage of electric charges. If the surface of the sheet is, the oxide coating acts as an insulator. Foil capacitors are commonly found in electrical appliances, including televisions and computers.
Geochemical sampling: Aluminum foil is used by geochemists to protect rock samples. It provides a seal from organic solvents and not tarnish the samples as they are transported from the field to the laboratory.
Art and Decoration: Anodized aluminum foil creates a layer of oxide on the aluminum surface that can accept colored dyes or metal salts. Through this technique, aluminum sheets used to create cheap, brightly colored.

Aluminum foil merged with flexible films to create lightweight packages. This technology allows packets that expand during production, then contract as the product is consumed. Packaging pet food, tuna, coffee and soups only produced 13 billion packages that are candidates for replacing paper-based flexible aluminum packages.

Electric

The electrical wiring of aluminum was used for the first time for public service applications in 1900. The use of aluminum wiring grew rapidly after World War II and has increasingly replaced copper as conductor in the election for utility networks. The metal has significant cost advantages and weight of copper and is now the preferred for use in the transmission and distribution of electricity material.
Aluminum alloy conductors AA-8000 series have more than 40 years of reliable field facilities have been expressly recognized by the National Electrical Code for over three decades.
The aluminum alloy wires have been used safely for the construction and wiring of houses for over 40 years.

Approved by the National Electrical Code

The National Electric Code in the United States require the use of a conductive material aluminum alloy electrical grade AA-8000 series for most applications wire construction.
The electric utilities have relied on aluminum conductors for transmitting power over national networks in more than a century.
Aluminum has advantages of cost and weight of copper and is preferred for the transmission and distribution of electricity used today material. Because the ratio of upper conductivity-weight aluminum compared to copper, the metal is now used for wiring in homes, buildings, aircraft and appliances.

Advantages as an electrically conductive material

Aluminum has also been adapted for use as rigid electrical conductor. (A raceway system is a pipe used for protecting electric wiring and conduction.) Unlike the steel pipe, therrigid aluminum is corrosion resistant and does not rust. These properties of aluminum are vital for electrical applications in coal mines, grain elevators and refineries (where sparks can lead to catastrophic results).

History aluminum wiring

In 1882, Edison Electric opened the first station steam generating electrical energy in the world. This station lighting supplies electricity to local consumers. At that time, aluminum was considered a precious metal and valued higher than gold and silver. Copper was readily available as conductive material. For the Edison station and during the early development of national energy networks, copper was the practical option.

Aluminum was first used for electric utility applications in 1900. "The Northwest Elevated Railway Co. of Chicago has used 150,000 pounds of aluminum to equip its airstrip in Chicago."

A finding

In 1882, aluminum was considered a precious and more valuable than gold and silver metal. Today, aluminum is a LEED material used in the construction and operation of high performance green buildings.
Research now indicates that aluminum nanoparticle technology may be the best candidate for nanotechnology harvesting solar energy.

The new solar energy applications: tacos, microscopic aluminum

In new research, scientists have shown that the efficiency of solar panels designs can be improved up to 22% covering surfaces with aluminum studs. These studs, measuring less than 100 nanometers in length, reflect light in the absorption layer of solar panels. This technology opens the potential for production of flexible solar panels that could be applied to curved surfaces: laptops and portable devices.

Electronics and Appliances

The history of aluminum appliances

To trace the history of aluminum in appliances is important to trace the history of the cookware. In 1911, Bernhardt Ziegler, an entrepreneur who had organized his own company fire insurance (while still in high school), set out to find an industry in his hometown of Wisconsin (West Bend). Impressed by the growth of aluminum cookware companies in other parts of the country, he recruited a team of investment and together invested $ 7000 to start a business. West Aluminum Company was born. West Bend expanded its product lines aluminum cookware for 50 years.
Since the introduction of aluminum in major US markets in early 1900, the scope of this metal has grown enormously. As aluminum enters its second century of widespread use, new scientific and production technologies continue to expand its potential market. Nanotech Batteries panel and aluminum-air solar help pave the way for the development of new and innovative markets in the XXI century.
There portable devices, appliances (washer, dryer, refrigerator) based on aluminum, because of the light weight thereof, structural strength and thermal characteristics. iconic brands like Presto products for cooking and Apple iPod, iPad and iPhone share one common feature: the use of aluminum.

Washers and dryers aluminum debuted big in the 1940s

Labor saving devices made of aluminum man shook the consumer market after World War II. The washer led the way.

Small appliances aluminum were popularized in the 70's

West Bend, a company of aluminum cookware founded in 1911, published his iconic Cooker Presto in 1970.

Revolution applying aluminum

Within two years of the end of World War II, large manufacturers have shifted their plants to produce ultra-modern devices saving labor: electric washers and dryers. Aluminum coolers followed, since the metal is ideal for refrigeration material. Its metallurgical characteristics of transmit heat quickly, which facilitates the cooling process and ensures highly efficient cooling. Modern refrigerators would not exist as they are today without the advantages of lightweight aluminum and thermal conductivity.

The chic and elegant choice for appliances

Aluminum appliances took another step forward in the futuristic visual appeal in late 1980. Inspired by the modern look of brushed aluminum panels, they began to produce entire lines of brushed aluminum appliances. Today, the "kitchen brushed aluminum" is considered as a fashion statement style, ergonomics and efficiency.

An early and sustained impact on consumer electronics

The use of aluminum in consumer electronics began in part with innovative designs that came from the engineering labs of Apple. The company popularized aluminum laptops in 2003 with the introduction of the Power Book G4 aluminum. In 2008, Apple took the lead in another revolutionary use of aluminum, through its development unibody enclosures. The manufacturing process monocoque chassis height one block of aluminum. Unibody chassis were presented for the first time in laptops MacBook Pro and MacBook Air.

HDTV: on a wall near you.

Aluminum chassis for HDTV provides the strength and the necessary protection for sensitive electronics and display of HDTV. The lightweight nature of the metal means that wide-screen TVs can be mounted safely on standard walls without internal or external reinforcement.

HDTV can be mounted securely on the wall because aluminum.

The average weight of a HDTV 40-inch aluminum housing is 40 pounds. A model of equivalent steel would weigh 100 pounds.

The history of aluminum in cars

Aluminum has been a key material for automakers since its inception. The first sports car with an aluminum body was presented at the International Auto Show in Berlin in 1899. Two years later, the first engine with aluminum parts was developed by Carl Benz. In World War II, aluminum had become cheap enough to be considered for use in vehicles

manufactured in series. A breakthrough came in 1961 when the British company Land Rover produces engine blocks V-8 made with aluminum cylinder. From there, the aluminum auto parts gained a foothold on wheels and gearboxes and then moved to cylinder heads and suspension joints. This infinitely recyclable metal is now the main material for use in powertrain applications and wheels and continues to gain market share in hoods, trunks, doors and bumpers and structures of complete vehicles.
Aluminum builds the best vehicle. The use of aluminum in cars and commercial vehicles is accelerating, offering the fastest, safest, most friendly and environmentally profitable to increase performance, increase fuel economy and reduce emissions manner. The Aluminum Association (ATG) communicates the benefits of aluminum in transportation through research programs and related outreach activities.

Aluminum-air batteries

Aluminum-air batteries, remarkable power and efficiency provide the potential to power the electric cars of up to 1,000 miles.
The Al-aluminum air battery consumes fuel. The energy density of aluminum far exceeds conventional battery technologies and can compete with gasoline and diesel. A global auto manufacturer has contracted to purchase volumes of production start-up battery in 2017.
The use of aluminum automotive has grown continuously for 40 years. Aluminum is now, after the steel, the material used in vehicles.
At the end of the life of a vehicle almost 90% of aluminum, on average, it is recycled.

Energy efficiency

Compared with a fleet of traditional steel, aluminum use saves the equivalent of 108 million barrels of crude oil into energy.

Performance benefits

Because aluminum is lighter, it allows the automakers increase resistance that can make thicker body panels while still losing weight. A vehicle with weight has better acceleration, braking better and better handling. In addition, lighter vehicles can haul and tow more because the engine is not carrying unnecessary weight.

Weight, strength and safety benefits

The structure aluminum vehicle can provide a weight saving of up to 50% compared to traditional steel structure. Aluminum structures are equal or superior in strength steel and absorb twice the energy induced shock. It also allows other vehicle systems can be reduced (including the engine, transmission, suspension and wheels). In general, weight, strength and security, the advantages of aluminum are clear.

Environmental benefits

Aluminum intensive vehicle can achieve a reduction of up to 20% of total consumption life cycle energy and a reduction of up to 17% in CO2 emissions.

Looking ahead: The race for fuel efficiency

Increasingly consumers are demanding vehicles with low fuel consumption. The new regulations require fuel economy of a vehicle in the United States, on average, walk 54.5 miles per gallon by 2025. This weight reduction will allow Ford trucks go further on a gallon of gasoline and will open the door to other changes such as smaller engines, which can further increase fuel economy.

Fun fact: The Clear Choice of Automakers

In 2013, Ford president and CEO Alan Mulally in the announcement of the new F-150 said: "Pound for pound, aluminum is stronger and tougher than steel" and "will be the material of choice" for Ford progress.
The automotive industry continues to lead the way in innovation of aluminum products. Ford launches all-aluminum-body F-150 in 2015. The truck weighs 700 pounds. This weight reduction will allow Ford trucks improve fuel efficiency and increase safety, all without sacrificing performance.

IV.**Objectives spec í tists:**

IV.1 Information technology needed for manufacturing processes ACD aluminum products.
Analysis of competition

IV.2 technology used for ACD aluminum products used in the electronics industry in Mexico.

IV.3 field analysis technology applied to the product shown in the electronics industry in Mexico.

IV.4 international norms and standards for technology and manufactured products for the electrical and electronics industry.

IV.5 Identification of electronic companies in Mexico that require ACD technology applied aluminum.
IV.6 identify complementary products aluminum products ACD.
Information concerning this point is inferred from the control matrix interviews with representative companies in the electronics sector in Mexico.

V. Work methodology

V.1 Defining the problem

V.2 Development approach to the problem

V.3 Formulation of research design

V.3.1 Development of interview formats
V.3.2 Development of control matrix

V.4 Fieldwork or data collection

Interviews V.5 clients:

- **Phone calls**
- **Personal in depth**
- **Focus group}**
-

V.6 Preparation and analysis

V.7 Preparation and submission of the report

Because aluminum ACD is the result of a very specialized process, interviews should be specific and concrete, addressed to specialized companies in the sector; for which the following interview format was designed:

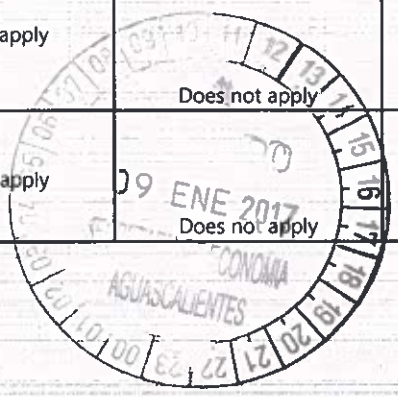
Interview format
Market Leaders of Electrical-Electronics Industry

This questionnaire is developed to meet specialized aluminum products ACD consuming electronics industry in Mexico information.

	date :	
E ompany:		
Interviewed :		
Question	**Answer**	**Observations**
1. He considers that aluminum is an important step in the development of electronic industry metal or single? (development of semiconductor chips, computers, communication or n, automotive, etc.)		
2. Qu é types of aluminum are used in the company?		

Control Matrix Interviews					
Do not.	Questions	Sensata Technologies	Flextronics (Flex)	Texas Instruments	Quasars group
	3. Aluminum ACD know?				
	4. Use n in this aluminum company?				
	5. In qu é products, parts and / or components?				
	6. It requires special equipment or processes for utilization or n parts or aluminum components ACD?				
	7. It has competent staff for aluminum processes using ACD? 8. Cu to are their requirements ?				
	Who are your suppliers of aluminum components ACD? What is the country of origin of the commissary?				
	You can identify some companies that require it?				
	Known products requiring the electronics industry and electronic components using aluminum ACD?				
	9. Meet the n ORMS and is to international ndares for technology í ay manufactured products for the electronic industry or unique?				
	What parts and / or components considered could be replaced by aluminum ACD?				
	Since the transport system and management integrated into their production processes require extreme protection to ensure the integrity of small devices called "tray" made of aluminum ACD coated white anodized microcircuits, we want to know your opinion about the importance this point.				

1	**They believe that aluminum is an important metal in the development of electronic sector? (Development of semiconductor chips, computers, communications, automotive, etc.)**	Yes, since in integrated circuits and power devices aluminum wire is used, instead of gold. This wire is 5 times thinner than a human hair.	Considered within its institutional growth a special area for use of metals.	Aluminum is important, but can also be used stainless steel.	Yes, aluminum is ve durable ar lightweight, besid having a high electric conductivity.
2	**What type (s) of aluminum is used in the company?**	Tins and gold in integrated circuits (ASIC) and copper.	Company dedicated to the manufacture of electronic components, their OEM products can be both hardware and software. The company operates to address various areas such as computing, industrial, automotive and medicine; however, they are currently developing a diversification strategy that includes changing social Flex reason, as well as new markets. The work they do is contract with customers, so do not directly produce aluminum products.	Texas Instruments Aguascalientes, being part of an international company, directly receives inputs from its parent company, using aluminum in nanometer scale.	Quasars Group do not use aluminu because manufactures th plastic parts of hearir aids, and design on for heatsinks.
3	**Aluminum ACD know?**	The interviewee knows but the company is not concerned, they know that the aluminum wire should come treated with that condition.	If they are known, but feel it is expensive and there are cheaper alloys and processes.	Do not	Do not
4	**Used in this aluminum company?**	Not directly, as they buy the parts to be assembled. Probably providers they use.	It has not been requested by any of its customers.	Do not	Does not apply
5	**What products, parts and / or components?**	Example: Integrated circuits, power devices.	Does not apply	Does not apply	Does not apply
6	**It requires special equipment or processes for the use of aluminum parts or components ACD?**	Do not	Does not apply	Does not apply	Does not apply
7	**It has competent staff for aluminum processes using ACD? Requirements?**	Does not apply	Does not apply	Does not apply	Does not apply



Referring to Fig.	**Who are your suppliers of electronic components? - What is your country of origin?**	Hana, Mektec, Tong-Hsing. Source: Mainly Asia, Israel and Germany.	Texas Instruments and Arrow. One of its institutional policies is to develop the local proveduría, especially the automotive sector, for the sole purpose of substituting imports and reduce costs. Because specialize their client work areas, commissary is developed according to the needs of this. A potential suppliers product catalog request them, as in the present case, aluminum acd, to analyze applications and uses.	U.S	
Referring to Fig.	**You can identify some companies that require it?**	Texas Instruments, proveeduría Flex application.	Do not	Do not	Texas Instrument Nissan monoblocks
10	**Known products requiring the electronics industry and electronic components using aluminum ACD?**	Asic, Mems.		No, as said, other materials may be used.	Drivers, Cards, Chips.
eleven	**Meet international standards and standards for technology and manufactured products for the electronics industry?**	ASTMF-487 standard aluminum wire.		the rules of the country where the parent company, in this case, the United States are covered.	
12	**What party considers that could be replaced by aluminum ACD?**	Asic: No, you have to be golden. Mems: are aluminum, aluminum alloys, for example with 1% silicon.	As for aluminum material they see very little, prefer standard alloys.	small aluminum baskets used on a small scale.	Components of th medical industry ar even high-quali cuisine.
13	**Since the transport system and management integrated into their production processes require extreme protection to ensure the integrity of small devices called "tray" made of aluminum ACD coated white anodized microcircuits, we would like to know your opinion about the**	Sensible not in metallic material used in the transport system, electrostatic charges dissipative material used. This is internal use only and tested by them. The user changes every year.		Here the baskets are used mentioned above.	Does not apply

	importance this point.				

The company was selected **Flextronics Aguascalientes** for an interview, because for a long time has been devoted to the manufacture of electronic components, their OEM products can be both hardware and software. The company operates to address various fields: computing, industrial, automotive and medical. Currently the company is turning its activities and has therefore changed its name to **Flex** , with clients such as Sensus, Xerox, Philips, Intelesens, among others, with products such as hospital beds, tablets, sink grids, lights on, etc., all according to the needs of its customers.

The reason why it changed its name, is due to a rapidly evolving market, where intelligence is critical to stay ahead, working with partners around the world. Flex is a pioneer in a new era of intelligent products that help you live better world.

According to a publication of The Financial of 26 February 2016, **Flex** is part of the 10 giant that drive the electronics industry in Mexico.

The relevance of Mexico within electronics production worldwide, is attracting more investment from technology companies to the country.

As consumption grows technological devices, such as screens, cell phones and computers, manufacturing companies looking to expand their presence in the territories where they are or close to reach new markets and, which has benefited Mexico.

Proméxico has located at least 35 medium and large technology companies with production plants in the country, of which 10 companies that stand out for their investments and number of factories, leading the sector. These firms are Foxconn, LG, Samsung, BlackBerry, **Flex** , Intel, HP, Panasonic, Ericsson and Motorola.

One of the most recent investments Flex is 20 million dollars in the state of Jalisco. The firm has more than 17 years in the country and has facilities in Guadalajara, Chihuahua, Tijuana, Aguascalientes and Coahuila.

Flex is also in charge of half of the production of BlackBerry in Mexico, in 2014 the company moved its entire operation to Ciudad Juarez, Chihuahua, as part of its plan to reposition itself in the country.

Samsung Electronics, meanwhile, announced in October 2014 an investment of 100 million dollars in order to strengthen its operation in Tijuana, Baja California, in the next five years. In Tijuana, the company manufactures its Smart TVs and LCD screens.

According to data Proméxico, it is expected that the value of the production of electronic grow 35 percent by 2020, to reach 87 thousand 608 million dollars compared to 64 billion 764 million with the estimated closed in 2014.

Foxconn, the world leader in the production of electronic, together with LG, Taiwanese are companies that have invested in the country. The first has allocated more than $ 230 million to expand its facilities along the Mexican border, while LG accumulated investments of over 360 million dollars in the last four years.

Intel meanwhile opened a development center in Guadalajara, Jalisco, with an investment of 173 million dollars.

Other companies such as Panasonic, Motorola, Hewlett-Packard and Ericsson have also decided to expand its operations through investments in its production plants in the country.

These groups are concentrated mostly in northern Mexico. The states with the highest production in the industry are: Baja California, Chihuahua, Jalisco, Nuevo Leon, Aguascalientes, Sonora, Tamaulipas, Coahuila, State of Mexico, Queretaro, Durango and Yucatan, in that order. These entities have 679 firms had employment facilities 2013-458000 563 people, according to INEGI.

Executives **Flex Aguascalientes** tell us that the company does not use aluminum in its products ACD because it is expensive, while there are alloys and / or cheaper processes; further notes that have an area on the ground (Metal Fab) in working with metals in order to have advantages in vertical integration.

With respect to aluminum in general, very little work, only handle standard alloys and mainly occupy sheet; however, they are open to the development of suppliers and willing to meet the product (s) Aluminium Company ACD **Jidoka.**

Contact for supplier development:

Ing. Oscar Arellano
Boulevard Zacatecas Km. 9.5,
Jesus Maria, Ags., Mexico, CP 20900.
Phone: (449) 910 71 00 ext. 4388
Oscar.Arellano@flextronics.com

Another company that was considered as relevant in this sector is **Sensata Technologies.**

Sensata
Technologies

This company manufactures devices that improve safety, efficiency and comfort for millions of people every day, used in automotive, appliance, aircraft, military industry, heavy vehicles, heating, air conditioning, data management, telecommunications, recreational vehicles and more applications.

In Aguascalientes it is considered a leader in the knowledge, application and development of high-tech electronic devices, therefore consider it important to include it in this project.

Executives **Sensata** tell us they do consider important aluminum in the development of electronic industry, especially in integrated circuits , power devices, in which aluminum wire is used instead of gold, with the characteristic of being 5 times thinner than a human hair. They believe that aluminum ACD is especially important because it minimizes pores.

Directly in the company tins, copper and gold are used mainly in integrated circuits (ASIC).

Not directly know the use of aluminum ACD in your company, however, they agree that the aluminum wire should come treated with this condition; They believe they are directly providers (Asia, Israel and Germany) who use these materials in their products.

Among the parts that may be replaced with aluminum ACD of the products they know, they mention that there is the ASIC (Application Specific Integrated Circuit), which does not have to be gold; MEMS (microelectromechanical systems) thereof which are aluminum and 1% silicon and aluminum alloys.

As the transport system "Tray" in Sensata no metal is used in the trays, anodized material that will not rust is used also for electrostatic discharge is dissipative. The use of these trays is internal only, as they have proven from plant to plant the metal is not necessary, moreover, the internal user changes every year.

Suppliers of aluminum components are Hana, Mektec, Tong Hsing.

They consider that there are companies in the sector that do require and use aluminum ACD, such as wire wonder, ball bonding, which are commonly gold.

Texas Instruments requires and uses aluminum ACD, while **Sensata** uses under providers.

In the automotive sector, they say that the use of aluminum components ACD occurs in engine and transmission.

Following the opinion of Ing. Vällín Jesus Contreras, presented expert in such matters, currently COO of the company METALISTIK, SA DE CV

METALISTIK

Metalistik is a company with capital from AGUASCALIENTES. It adds to the supply chain of the automotive sector in the state of Aguascalientes.

The ship is located in the municipality of Jesus Maria and is dedicated to the manufacture of machining, stamping and assembly-prints. The Mexican company applied an estimated 25 million pesos investment, enabled a space of 1,400 square meters in the former premises of Novatex.

Metalistik's mission is to minimize import costs through parts localization efforts, seize the moment Industrial Aguascalientes lives in the automotive sector to catapult into other industries and geographies.

Its main customer is Flextronics and is in the process of development of parts and processes with NISSAN, Sanoh, Sumitomo, Gestamp, Okawa, among others.
Review transcript of Mr. Vallín Contreras.:
"Get information about potential customers for the distribution of aluminum ACD is hardly achieved with companies located in Mexico, because these are only maquiladoras, they are the design and manufacture as the owners simply tell them, if they change a bit the run.
I recommend defining companies in the electric-electronic sector in Mexico that consume aluminum, specifications and volumes and obviously their country of origin, so that the aluminum ACD is offered there, where decision makers for such radical changes are, as is the matter cousin.
For example, large aluminum smelters are the same Nissan and Ahresty in Zacatecas melting engine heads, so I recommend getting what or what alloys used and their volumes are technically analyze whether the ACD replaced with advantages to current and if so, then propose to the parent possibility.
None of the companies mentioned, which are regional large consumers of aluminum, aluminum used for the time ACD. We should analyze whether the distribution of aluminum for residential use or appliances or even in aerospace Querétaro or Tijuana, which have a very high consumption of aluminum parts the ACD has no chance.
I recommend that the customer provide information on benefits of aluminum alloys ACD and what could replace, because there aluminums high aluminum content such as 1050,

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1100, among many others; 5052 aluminums like there in different hardnesses. The most common is the 6061 T6, practically it is the best-selling to all kinds of industrial applications, but there are many special alloys used in casting and injection molding (die casting) ".

Also, in the final report pending interviews carried out with companies like TEXAS INSTRUMENTS (June 3, 2016, for being the contact in Asia), GROUP quasars, whose legal representative is the President of the Cluster of Electronics in Aguascalientes will be incorporated (CELESA), and others, installed in Aguascalientes and other entities of the Republic, and the conclusions of this study.

CURRICULUM VITAE

ING. Vallin JESUS CONTRERAS

general

Address: Redondel 109, Fracc. Villas de San Nicolas, Aguascalientes, Ags.
Date of birth: June 3, 1960
Marital status Married
Wife: Alma Leticia Ramos Hernandez
Children: Liliana, Jesus Eduardo, Roberto
Grandchildren: Victoria and Alejandro
Phone: 449 912 49 82 House, Telcel 449 413 98 37

Scholarship

2013-Date Doctor of Pedagogical Knowledge Advanced, Universidad Complutense de Madrid, Thesis: Process Executive Management to Operate a Higher Educational Model Based on Competence in the Middle levels and Mexico
2010-12 Master of Educational Technology, Monterrey Institute of Technology and Higher Education
1977-1982 Industrial Engineering, Technological Institute of Aguascalientes
1982- To date, several specialties, diplomas, courses, seminars and workshops on topics such as:
Quality and productivity
Sales
Strategic Planning
managerial behavior
Human resources management
Management techniques
Negotiation
Purchases
Development of entrepreneurs
Development of thinking abilities
Private management of public enterprises and
ISO 9000
Coaching and Effective Management

Professional experience

1977-1979 Human Resources Consulting SC
Initial Position: Administrative Assistant

Since the end: Sorting and assessor staff

1979-1980 Multibanco Comermex SA

Initial Position: Cashier street

Final position: Assistant Portfolio

1980-1982 Banca Promex SA

Initial Position: Head of portfolio

Final position: Assistant Credit Officer

1983-1989 Volkswagen de Mexico SA

I started in the program consisting of volunteers in developing Mexican officials to replace the German plant, for which they selected us to 85 graduates throughout the Republic and participate in a training program for 3 years. I finished the training was productive material buyer, because where I had the opportunity to coordinate the national integration program parts, for which various Mexican suppliers developed. Eventually I was promoted to head of group of productive material purchases.

Extinguishers 1989-1991 Firex SA

I started as a manager in a final assembly operation 12 people, some managing to improve production systems and improve the quality and delivery times to customers. Later I was promoted to plant manager with 120 employees under my responsibility, achieving among other things improve product cost, optimize various production processes, install the system and implement quality systems in time with two clients.

1991-1991 Robert Bosch SA

Coordinator sales forecast, I developed a simulation system to determine the best economic scenario forecast sales for the year, with monthly reviews, which was the basis of the production program and budget.

1991-1994 Technological University of Aguascalientes

Race director Production Process, being founding director main activity was to strengthen career in academic aspects regarding selection and training of teachers and adaptation of curriculum content and implement career linking schemes.

1994-96 SC Integral Systems Improvement

own office where realized activities as a consultant in productivity for micro and small businesses serving a little more than 100 companies most of which was improved productivity indicators

1996-2004 Ministry of Economic Development

I started as Director for the Promotion of Micro and Small Enterprise and I finished as Secretary for Small and Medium Enterprises. In the nine years I promoted, I Instrumente and participated in various programs to promote small business on issues such as training, consulting, technical assistance, financing, entrepreneurship, research, technological development and regional development, drawing on combined federal resources to state and municipal. He also coordinated the certification ISO 9001-2000 Secretariat

2005- 2006 Municipality Aguascalientes

Secretary of Administration with responsibility for the areas of human resources, technological modernization, general services, quality assurance and material resources, highlighting achievements such as the installation of the e-shopping page municipality at that time was one of the more complete and interactive country, ISO 9001-2000

certification in the municipality in all areas and the training of over 4 ml people in less than a year with a low budget.

2006-2013 College of Professional Technical Education of Guanajuato, Guanajuato CONALEP

Director, Center for Assistance and Services Technology CAST, with the function to integrate educational services to the needs of entrepreneurs, through:

a. EVALUATION coordinating centers or n labor skills;
b. Improve graduation profiles of students;
c. Respond to requests for technological services or logical; and
d. ENABLING provide programs or na measure.

2006- Date Plastiags SA de CV and Precision Metal SA de CV

Partner and General Manager, companies plastic injection and precision machining, created in April 2006 and May 2009 respectively, which currently serve more than 10 clients with over 40 different products.

2013-Date Metalistik SA de CV

Partner and Director of Engineering, with the following responsibilities: Presales that includes determining the technical feasibility of new products and the price thereof; determination and installation of machinery and equipment; definition of production processes for the development of parts; optimization of production processes.

GRUPO QUASARES

Starting with the acquisition of PI Designs On Silicon, SA de CV, a company founded in October 1998 in the city of Aguascalientes, Ags., Quasars Group, SA de CV was incorporated in February 2003, where are located its headquarters , thus giving continuity to the same ideology and values with which PI on Silicon Designs has ruled. Quasars Group is a company dedicated exclusively to research, development, design and manufacture of Integral Systems.

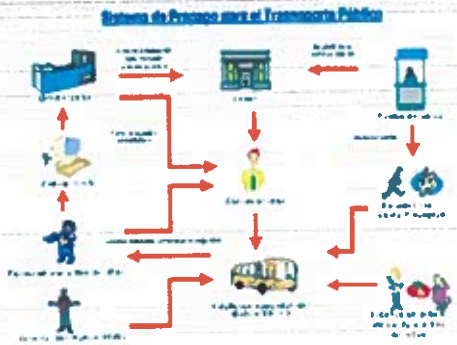
Quasars Group in our most important resource is our people: our customers and our employees. We believe that each of the involved contributes with ideas, innovations, expectations and hard work, this combined with our values; respect, trust, honesty, loyalty and integrity puts us on the map as one of the most successful companies in Latin America.

Quasars Group is a company formed by 15 engineers in Electronics committed to providing the highest standards of quality and service to meet the expectations of our customers, which allows us to keep in constant development and growth as a company.
Currently, our team of professionals involved in the design and development of various projects. Our curriculum contains various access control systems and automation of public transport among others.
In Quasars Group we believe that to ensure the success of each project, the quality should be carefully examined to ensure that only the best product is delivered to the customer. The project leader is responsible for ensuring that the highest quality is attached to each stage of development thereof; also reviewing all documentation against customer requirements in this way to ensure they are getting the best return on their investment in. This includes ensuring that everything is delivered on time and with the highest possible quality. Our professionalism, enthusiasm and responsibility are focused on helping our customers achieve their goals quickly and efficiently. Based on the above, the technical methodology Quasars Group has implemented for the development of customized systems, is based on the concept of process consisting of research, design, manufacture, installation, commissioning and documentation. This process allows us to ensure consistency in the conclusion of all our products and services.
We design integrated systems that offer:

- Design or custom
- Administration of the information
- Maintenance
- ENABLING
- System attention of Immediate Response (SADRI)
- Distribution of smart cards and prepaid

technology has undoubtedly played an important role in the development and progress of modern society, because it offers us a better quality of life. That is why dynamic cities require the incorporation of technological advances to improve its infrastructure and thereby improve the quality of services that society requires. In recent days, increase productivity and process efficiency, whatever its nature, has become a necessity; such is the case of urban transport services.
We design systems for different areas of public transport such as:

- Buses UBLIC
- minibuses
- taxis
- Buses for excursions
- Transport for to neos



Personal Access Control

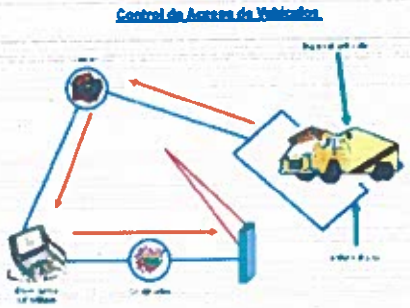
RFID allows control access of people without their need to take action to this ("hands-free"), just passing through checkpoints to be detected. People can use an ID card, which is the transponder, and will be identified up to 1m away from a point of reading (depends on the type of reader and antenna).

Vehicle Access Control

RFID is the ideal solution for automatically controlling the entry and exit of vehicles in parking lots, industries, condominiums, etc., offering low cost, high speed read operation and no maintenance solution. The transponders can be fixed to the vehicle, or be held by the driver. The antennas are left on the floor or on the side of the gateway. When the vehicle approaches the trasnponder antenna is read, access is released and automatically registered.

Inventory Control

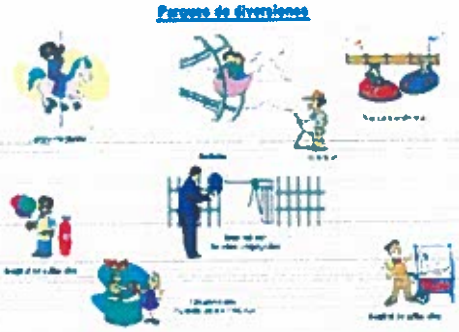
Quasars Group offers systems for identification and inventory control through a small RFID tags also are placed on products or objects that are part of the inventory. These can be traced to the different processes along and even once they have been placed in the vehicles in which they are transported. The use of these systems offers more advantages compared to the use of the traditional bar code.



Group Quasars provides an identification system using RFID, using credentials that inside contain passive tags (without batteries) high frequency to make the payment of the amount for use of mechanical play to the public user, this may be prepaid or payment instantly. Also a card to control attached, which contain information thereof. The cards have the characteristic of being reprogrammable and high safety, which makes them highly reliable. Card readers will be independent of the PC, they will have the ability to store events that occur (time and date of operation and counting) and then emptied to a PC via an interface for further processing.

Amusement parks (rides)

Events (sports and entertainment)



In conclusion: Quasars Group founded in 2003 in Aguascalientes, Mexico, is a company dedicated to the research, development, design and manufacture of integrated systems.

Treehouse began a partnership with Group manufacturing Quasars, SA de CV in 2008 and that relationship now extends to providing our customers integrated systems, firmware, software, and hardware design and manufacturing modules.

Some of the companies that GQ has provided development services and manufacturing systems are: Nissan, Flextronics, attractions Garci, Miraplastek, Pemex and Westone Labs.

GQ services include assembly of electronic products and other products, under the supervision of the engineers who designed them. It is registered as import and export company with IMMEX program and uses highly trained operators with quality oriented service.

Quasars group is a representative company in Aguascalientes the electronics sector, so that it was considered important to include in this study. Its director and founder Iraam Antonio López Salas currently serves as president of the Cluster of Electronics in Aguascalientes, (CELESA).
According to the interview we present the following conclusions:

- Ing. Lopez Salas considers aluminum t is important in the industry because it is lightweight, durable and has a high electric conductivity .
- Quasars Group does not currently use aluminum processes, but require it considers a suitable material.
- ACD aluminum not known
- He considers there are areas of significant opportunity for this type of aluminum such as: automotive, medical industry and even kitchen products of high quality.

TEXAS INSTRUMENTS

Texas Instruments is an American based company, in Dallas Texas, that develops and markets , semiconductors . It is the third largest semiconductor manufacturer in the world tras Intely Samsung and and it is the largest supplier of digital signals and semicondoctors and analogic semiconductors, of integrated circuits for mobile phones . At the same time

it is the largest producer of and analog semiconductors. Other areas of activity includes integrated circuits for broadband, computer peripherals, digital consumer devices and currently, TI is comprised of two main divisions: Semiconductors (SC) and Educational & Productivity Solutions (E & PS, are their abbreviations in English). A third division, Sensors and Control (S & C), was sold to Bain Capital LLC in 2006, and subsequently renamed Sensata.

SC-Semiconductors

Approximately 85% of revenues come from IT semiconductor division. TI maintains a leading position in many product areas, including digital signal processors (with the TMS320 series), analog / digital and digital / analog converters, high - speed solutions for power management and analog circuits for high performance. Wireless communications are a key focus for IT, about 50% of all mobile phones sold worldwide contain TI chips. It also manufactures other products based on semiconductors, from integrated circuits for specific applications up to microcontrollers.

handsets

The handsets department is part of the division of semiconductors and is the world's largest supplier of integrated circuits for sets of wireless applications.

Products for specific applications

Another department semiconductor division is dedicated to developing specific products for a wide range of applications of PDS like:

- ° Digital Photographic cameras
- ° Modems broadband
- ° Cablemodems

- Voice over IP (VoIP)
- Devices image
- Recognition and understanding or n Voice
- Local networks (LAN) wireless
- RFID

DLP-Digital Light Processing

TI is the only supplier of semiconductor components with micromirrors (DMD-Digital Micromirror Device) required in the digital light processing (DLP, for its acronym in English), technology used in video projectors and televisions. Philippe Binant made in 2000, the first public projection of digital cinema in Europe, founded on the application of a MEMS developed by TI.

DSP-Processors Digital Signal

TI manufactures a wide range of digital signal processors under the generic name TMS320, as well as multi-core processors (Texas Instruments OMAP, DaVinci).

Given its importance in the electronics sector is relevant participation in this study.

A senior company executive gave us the interview, providing the following relevant information:

- Texas Instruments uses aluminum in nanometrica scale directly from the United States.
- In relation or n the use of Aluminum ACD, says they use stainless steel and titanium above.
- No aluminum used in the process .

- small baskets of aluminum production, are used in low production, but are not required with the characterstics of ACD .

- considers that stainless steel has more to potential.
- sheet anodized is a good alternative.

Also, the opinion of Mr. Cisneros presents David Castro, an expert on such issues, who currently holds the position of. Commercial Leader Logistics Platform Aguascalientes TRACOMEX GROUP:

The current TRACOMEX Group, has its origins in 1974 when the staff who used to move around the country units were assembled at the Chrysler plant, broke out on strike, completely blocking the floor of Lake Albert in Mexico City .
Mr. Jack Parkinson, at that time CEO of Chrysler de Mexico, the Mexican summoned Chrysler Dealers Association (AMDIC) a meeting with staff of the Department of Industrial Relations of the plant. At that meeting, I informed distributors to avoid problems like that was living, from the date the Association would be responsible for the distribution of vehicles. Distributors decided to form a conveyor, transfer Automotive, transport company units with the participation of all Distributors whose aim was to distribute Chrysler vehicles

bought from the plant. Automotive transfer was responsible for solving the problem of the strike.
In November 2010 it opened in Aguascalientes Intermodal Terminal Chicalote Tracomex.

Modern facilities consist of 350 thousand square meters of land, 3 rail spurs with a length of 850 meters each, establishing a connection on the east side to the tracks of the Mexican rail in the stretch Saltillo-San Luis Potosi-Chicalote; also, you have the option to connect to the Ferromex way in the stretch Zacatecas Aguascalientes.
Currently, at this point they received an annual average of 50,000 imported units automakers Daimler Chrysler and Ford, which are distributed to dealers of the Bajio, West and Pacific areas.

Services

- Moving vehicles
- Movement flotillas
- *Vehicle Parking*
- Homologation and manufactured of new vehicles

Other products and tools

In addition to providing the shuttle service of new vehicles, it is also important to provide software solutions to its customers agencies and automotive suppliers.

DOL

Having a control system fully integrated information within a car dealership achieves greater speed and efficiency in customer care, keeping the forefront of technology through continuous updating agreements. The main objective of the system is to provide automotive dealers through the system **DOL** safety of total integrity in the flow of information and the proper management of revenues, expenses and discounts granted.

OMNITRACS

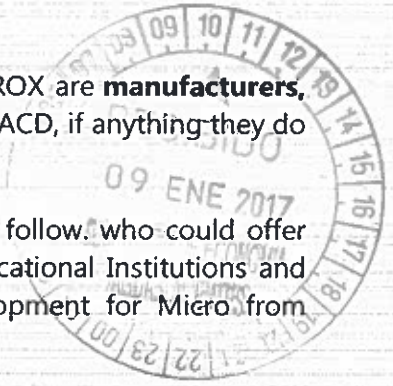
With the latest technology, they have managed to stay ahead in their logistics processes, allowing them to have almost total control on the flow of information and reliable data and efficient information. Thus, they have the exact location of each of their tracts, to provide information about estimated arrival times in the delivery of their vehicles.

LUKVIN

System for inventory control using the GPS position of each unit for better location.

MIX & RO (MIX & ROUTE ORGANIZATION)

System planning and creating vehicle shipping routes.
Ing.David Cisneros says neither FLEX nor TEXAS SENSATA or XEROX are **manufacturers,** but they are maquiladoras or assemblers, so do not use aluminum ACD, if anything they do or they would be interested in doing their parent companies.



Therefore, those interested in developing provitions are these as follow. who could offer them, through the model Triple Helix (Government-Business-Educational Institutions and Centers for Research and Innovation), Program Supplier Development for Micro from Aguascalientes and Small Enterprises, intended to improve:

- Quality
- Cost
- Deliver
- Interchangeabilty
-

This program would aim to select a group of students for professional practice related careers of Institutions of Higher Education of the State (Industrial Engineering, among others), in order to apply a questionnaire, previously developed by the business sector and / or centers research and innovation, to detect the degree of maturity of business and opportunities for improvement aimed at achieving their development as providers of strategic sectors defined by the State Government in its National Development Plan.
Such a program would have key indicators to measure results based on a strategy of monitoring and evaluation.

CURRICULUM VITAE
ING. CASTRO DAVID CISNEROS
JOB SUMMARY AND EXPERTISE
GENERA L INFORMATION

- Birth Date: October 1st., 1949
- Birth Place: Otatitlán, Ver, Mexico
- Nationality: Mexican
- Status: Married
- height: 1.75 Mts.
  dcisneros49@hotmail.com

EDUCATION

- Degree: Industrial Mechanical Engineer
  Regional Technological Institute of Orizaba, Ver.
- Foreign Language: English

SPECIAL TRAINING PROGRAMS

- Excecutive Program Sloan School of Management
  Massachusetts Institute of Technology
- Top Management Program IPADE
- Creating World Class Manufacturing Enterprises Carnegie Mellon University; Monterrey Institute of Technology and Higher Education
- Quality and Productivity Special Studies Japan, Singapore, Malaysia (13 Companies visited)

• Quality and Productivity Diplomate	Monterrey Institute of Technology and Higher Education
• Strategic Personnel Management	Monterrey Institute of Technology and Higher Education

TRAINING AND COURSES

• International Supplier Quality Assurance	Xerox Rochester, NY
• Technical Production Supervision	Industrial Training Center
• Transactional Analysis for Supervisors	Xerox (Mexico)
• Procedures and Policies Development	Xerox (Mexico)
• Managerial Studies Program	Xerox (Mexico)
• Engineering Administration	Infotec (National Institute of Technological Development)
• Scientific and Effective Engineering Administration	Center for Professional Advancement (Chicago, IL)
• Advanced Supervision Seminar	Xerox (Mexico)
• Multi - National Drawing Interpretation	Xerox (Rochester, NY)
• Quality Circles for Managers and Company Directors	IMECCA (Mexican Institute of Quality Control)
• Leadership Through Quality Resource Planning	Mexico Xerox Manufacturing
• MRP II	Xerox (Mexico)
• Advanced Performance Manager Training	Aubrey Daniels & Associates (Atlanta, Georgia)
• Managerial Development Capacities	ICAMI (Intermediate Media Training Institute)
• Statistical Process Control (SMIP)	Southern California Manufacturing Operations
• Advanced Management Program	Xerox (Rochester, NY)
• Management by Facts	Xerox (Mexico)
• Empowerment	Xerox (Mexico)
• Reengineering	Xerox (Mexico)

• Six Sigma	Xerox (Mexico)
• Lean Manufacturing	Xerox (Mexico)

WORKING EXPERIENCE

• Strategic Planning Manager	Quality & Manufacturing Consulting Current
• Lean Manufacturing and Manufacturing Operations Consultant	PyroSmart Current
• Manufacturing Operations Consultant	Perez Commercial Profiles Feb. 2013 - Jul 2013.
• Aguascalientes Commercial Logistic Platform Leader	Tracomex group July 2011 -. Jan. 2013
• Aguascalientes Government, Economy Promotion Sub-Secretary	Economic Development Secretary Jan. 2006 - Nov. 2010
• Quality, Planning and Projects Manager	Aguascalientes Estate Water Institute Dec. 2004 - Dec. 2005
• Institutional Planning and Development Director	Polytechnic University of Ags Aug.2003 - mar.2004
• Manufacturing Services Manager	Flextronics Manufacturing Jan. 2002 - Apr. 2003
• Digital Product and Operations Support Business Unit Manager	Xerox Mexicana June 1999 -. Dec. 2001
• Mid-Volume Business Unit Manager	Xerox Mexicana Apr.1999 - May. 1999
• Plant Services and Human Resources Director	Xerox Mexicana Jan.1997 - Apr.1999
• Mid-Volume Products Business Unit Manager	Xerox Mexicana Apr. 1991 - Dec. 1996
• Low Volume Products Business Unit Manager	Xerox Mexicana Apr. 1991 - Dec. 1996
• Technical Support Manager	Xerox Mexicana July 1988 - Mar. 1991
• Manufacturing Operations Manager	Xerox Mexicana Oct. 1986 - Jun 1988.
• Product Quality Manager	Xerox Mexicana

	Oct. 1984 - Sep. 1986
• Quality Engineering Manager	Xerox Mexicana Sep.1983 - Sep.1984
• Advanced Manufacturing Engineering and New Programs Eng. Manager	Xerox Mexicana Feb. 1981 - Aug. 1983
• Supervisor Quality Control Engineer	Xerox Mexicana Sep. 1977 - Jan. 1981
• Quality Control Senior Engineer	Xerox Mexicana June 1976 -. Aug. 1977
• Supplies Quality Assurance Engineer	Xerox Mexicana June 1975 -. May. 1976
• Quality Control Engineer	Xerox Mexicana Jan. 1974 - May 1975
• Mechanical Maintenance Chief	manufacturer 3M 1973 - 1974
• Sugar Cane Quality Engineer	Kimberly Clark 1972 - Mexico
• Mechanical Maintenance Practitioner	Kimberly Clark 1972 - Mexico

TEAMWORK SIGNIFICANT EXPERIENCES

1989	National Quality Award Process
1993	ISO 9002 / ISO 14001 Certificate process
1993	Development and Implementation of Organization by Business Unit Concept
1993	Development and Implementation of Manufacturing Improvement Costs Unit (UMC)
nineteen ninety six	XEROX Aguascalientes Plant Strategic Planning for 1997 to 2000
1997	XEROX Aguascalientes Plant Strategic Planning for 1998 to 2001
1997	Development and Implementation of the Materials Recycling Plant Project
1997	Development and Implementation of the DIF Protegee Workshop

SPECIAL AKNOWLEDGEMENTS

1980, 1986, 1992, 1996, 1997, 1999	Presidents Club
1989	Special Merit Increase
1992	Key Position Merit Increase

1993 Award to "Professional Excellence" Villa Asuncion Rotary Club
1998 Institutes Technological Enterprise Development Award
nineteen ninety six Veracruz Port Distinguished Visitor

EXTERNAL ORGANIZATIONS INVOLVEMENT

- Xerox Mexicana Representative (now Flextronics) to the Aguascalientes Industrial Group.
- Aguascalientes Training Institute Management Council Member
- National Transformation Industry Chamber Vice-president
- Consultant for the Foundation Produce Aguascalientes AC
- Strategic Planning and Productivity Projects and Consultant Professor at the Autonomous University of Aguascalientes
- Net Citizens Territorial Member for the Reorganization of Aguascalientes Estate
- Total Quality Concepts Professor and Consultant at the Instituto Tecnologico de Aguascalientes
- Secretary of Organization for the Sorority of Veracruz

LECTURE TEACHING

- School of Business and administration or n (IPN)
- Technological Institute or logical and Higher Studies of Monterrey
- Bonaterra University of Aguascalientes
- Technological Institute or logical Veracruz
- Technological Institute or logical Orizaba
- Technological Institute or logical Aguascalientes
- Aut University or noma of Aguascalientes
- Institute of Directors or n P ú Republic of the State of Aguascalientes
- Universidad del Valle de M é xico

SPECIALIZED MAGAZINES INTERVIEWS

- expansion Magazine — Productivity Topics
- America Economics Magazine — Aguascalientes State Development

VI. **Deliverables**

VI.1 Report and conclusion of each of the certain specific objectives in the project, according to the schedule of the methodology proposed work.

- The ACD aluminum is not well known in the electronic industry or unique. According to the results of the interviews, other materials need success in the industry, such as aluminum wire and stainless steel.
- Most of the companies in the area, get their supplies from abroad, so that national development must be highly competitive in cost and quality for penetration or successful n in the market.
- A Flex Aguascalientes interested JIDOKA meet with the company to meet the applications and advantages of aluminum ACD, even it provides contact details proveeding development .
- Also it is necessary to mention that I will send an interview questionary of 30 micro and small enterprises form the electronic sector, stablish in the country. The few that answer manifested that they have not any knowledge of that type of aluminum.

VII.**Bibliography**

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http://www.almexa.com.mx/
http://www.agenciasinc.es