Alliance LLC Aluminum Extrusion Process

The Aluminum extrusion process is simple in overview, however it is very complex in each area of production:

1. Process starts with Aluminum Billets, which must be heated to about 800-925 ° F.

Aluminum extrusions are made from solid aluminum cylinders called billets, which are continuously cast from molten aluminum. Billets are available in a wide variety of alloys, pretreatments and dimensions, depending upon the requirements of the manufacturer.

- 2. After a billet reaches the desired temperature, it is transferred to the loader where a thin film of smut or lubricant is added to the billet and to the ram. The smut acts as a parting agent (lubricant) which keeps the two parts from sticking together.
- 3. The billet is transferred to the cradle.
- 4. The ram applies pressure to the dummy block which, in turn, pushes the billet until it is inside the container.
- 5. Under pressure the billet is crushed against the die, becoming shorter and wider until it has full contact with the container walls. While the aluminum is pushed through the die, liquid nitrogen flows around some sections of the die to cool it. This increases the life of the die and creates an inert atmosphere which keeps oxides from forming on the shape being extruded. In some cases nitrogen gas is used in place of liquid nitrogen. Nitrogen gas does not cool the die but does create an inert atmosphere.
- As a result of the pressure added to the billet, the soft Ram but solid metal begins to squeeze through the die opening.







- 7. As an extrusion exits the press, the temperature is taken on the press platen. This records the exit temperature of the aluminum extrusion. The main purpose of knowing the temperature is to maintain maximum press speeds. The target exit temperature for an extrusion is dependent upon the alloy. For example, the target exit temperature for the alloys 6063, 6463, 6063A, and 6101 is 930° F (minimum). The target exit temperature for the alloys 6005A, and 6061 is 950° F (minimum).
- Extrusions are pushed out of the die to the lead-out table and the puller, which guides metal down the run-out table during extrusion. While being pulled, the extrusion is cooled by a series of fans along the entire length of the run-out and cooling table.
- Not all of the billet can be used. The remainder (butt) contains oxides from the billet skin. The butt is sheared off and discarded while another billet is loaded and welded to a previously loaded billet and the extrusion process continues.
- 10. When the extrusion reaches a desired length, the extrusion is cut with a profile saw or a shear.
- 11. Metal is transferred (via belt or walking beams systems) from the run-out table to the cooling table.
- 12. After the aluminum has cooled and moved along the cooling table, it is then moved to the stretcher. Stretching straightens the extrusions and performs a 'work hardening' (molecular re-alignment which gives aluminum increased hardness and improved strength).
- 13. The next step is sawing. After extrusions have been stretched they are transferred to a saw table and cut to specific lengths. The standard cutting tolerance on saws is 0.125 inch or greater, depending on saw length (this is not the motor shell cut, instead it is the cut for the 18 foot standard extrusion). After the parts have been cut, they are loaded on a transportation device and moved into age ovens. Heat-treating or artificial aging hardens









the metal by speeding the aging process in a controlled temperature environment for a set amount of time. This is designated by the T after the allow number (ex: 6061T5). T5 are the profiles in the temper oven for 5 hours and T6 is 6 hours.

- 14. After the heat treating process, the parts are powder coated per custom specifications. They can also be Anodized in a variety of colors and finishes.
- 15. The extrusions of about 18 feet are cut to length for each specific part number. The ends are usually not to tolerance, therefore they are removed for scrap.
- 16. Parts are gauged for ID, OD, L, Flatness, etc. and are packaged according to specifications set internally or by our customers.





Inspection Process for Extruded Parts:

 Once the billet is made, a sample disc is sawed off and taken to the Mass Spectrometer for composition analysis to ensure the correct percentage of Si and Mg. These samples are marked and stored for future audits or if problems occur in the processing.



Composition Data



 Each stage of processing has controls and histograms.

3. When parts are powder coated, the coating thickness, hardness, and durability are tested using several methods as seen in the below figures.



Boiling at 8 hours on section

Scratch test



Salt Spray Chamber

4. Parts are checked dimensionally and are gauged as final inspection prior to packaging.

Information about our Aluminum Extrusion factory



Our plant is located near Hong Kong, in Foshan City. Headquarters is in Hong Kong and production is 3 hours away in Guangzhou province. As with most extruders, the majority of production is for the construction industry. However, unlike most extrusion factories in China, our plant produces a large percentage of Heat Sinks, Motor and Generator Housings, Automation Profiles, etc. Many of our customers have audited the plant for automotive and consumer electronics quality standards.

The plant is a fully integrated producer of aluminum extrusions, from the alloying and production of billets to the final painted or machined extrusion products and assemblies.

- Manufacturing space is over 500,000 sq. ft.
- 3 Blast Furnaces for billet production
- 12 Extrusion Presses from 600T to 2,200T
- 700 employees (40 engineers and technicians)
- Over 35,000T annual production
- 4 Anodizing lines with 14 tanks each
- 6 Diesel Generators for off-grid electric consumption

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For more information please call 219-548-3799