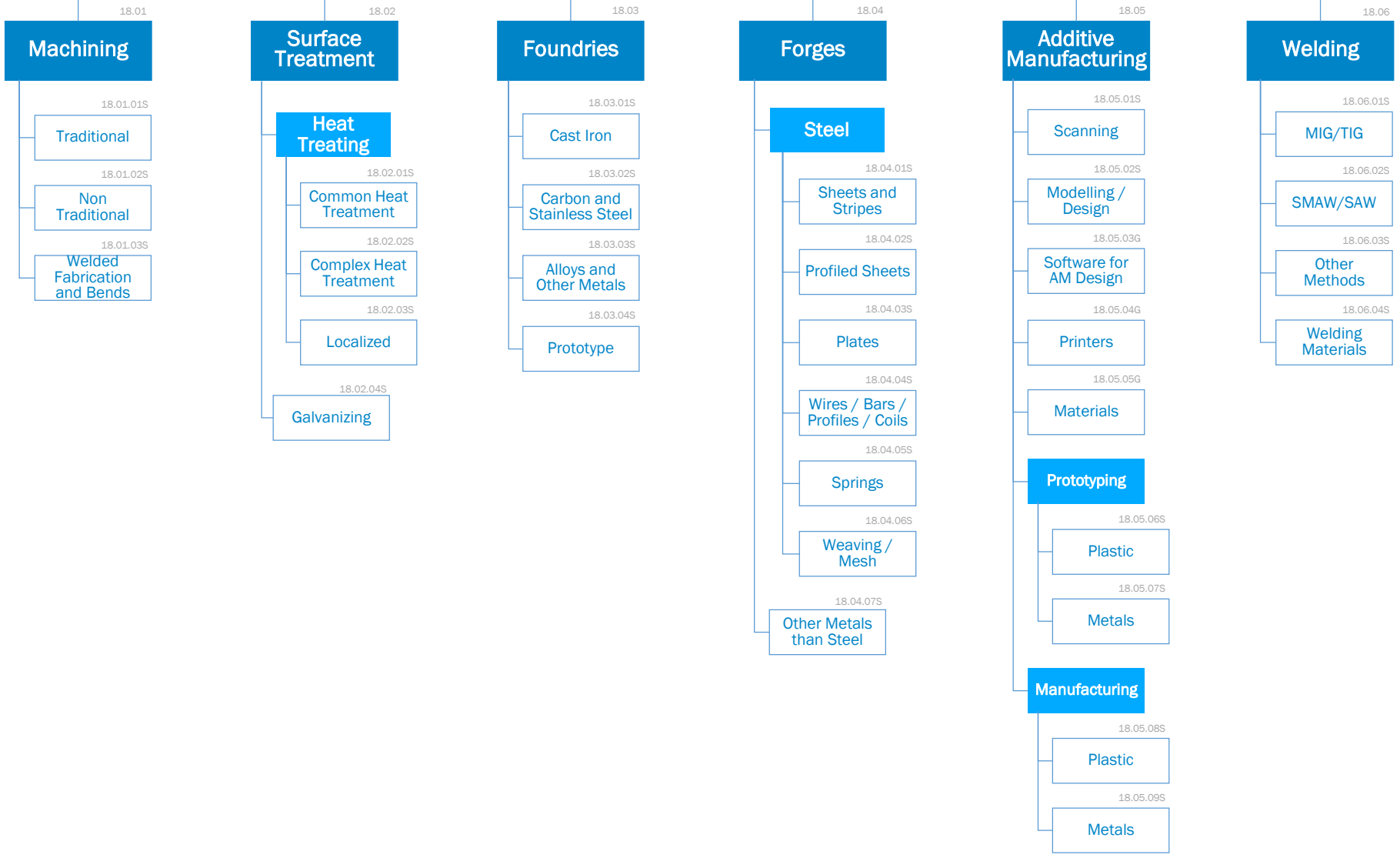
Manufacturing Works



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Manufacturing Works

Are those works performed to build base parts or sub-assemblies for major components, also these works and services are used to repair pieces or reproduce spare parts that are difficult to find.

These are also processes performed to material to give them the necessary properties to be able to resist certain given conditions.

In research and development there are also prototypes that can be produced through these processes.

Main rationales behind the Standard Categorization

Machining

- Machining family includes the works that give an specific shape to a piece through a controlled mechanical removal of material using machine tools
- The capabilities in the machining market are basically given by the process used to shape a piece
- Traditional machining category is defines as the traditional machining processes such as Turning, Drilling, Boring, Reaming and milling, in general all the activities that can be performed with a machine tool such as grinding
- Non Traditional machining is defined as the processes used to give shape to a piece to different methods than the included in the traditional category such as Water, Laser, Laser and Chemical cutting, as well as processes like stamping
- Weld fabrication and bends are the processes used to manufacture complex parts by welding two or more pieces giving as a result a part that itself is not a module or a finished equipment, in this category are included bends, because the suppliers who fabricate complex parts are commonly available to perform this activity

Surface Treatment

- Surface treatment is a chemical process that treats a surface and changes its physicochemical properties to make a particular part more suitable to resist hard conditions keeping the properties of the base material
- Common Heat treatment includes common treatments such as Annealing, Quenching, Tempering, Hardening and Aging
- Complex Heat treatments comprehend more complex activities and equipment than the ones used for the treatments described before such as Case Hardening (Carburizing and Nitriding) or Ion Implantation.
- Localized Heat Treatment refer to the stress relief treatment done to a surface after a welding process, this requires specific equipment and can be done at site.
- Related categories included in other Groups
  - Spraying or metallization, is not including among “Surface Treatment” family as the process to perform it is physical and protects a surface but do not change the properties of the base material, so this category can be found in the family “Coating” of the group 34 “Painting, Coating, Insulation and Sound Proofing”

Foundries

- Foundries are referred to the base materials from which is started a process of forging, these are usually the result of melting the ores coming from mines and are sold to industries to transform them in other raw materials
- The categories of this family are basically the differentiation between the major groups of metals used in industry; Cast Iron, Carbon and stainless steel and other Steel Alloys and materials, commonly the foundries are able to perform finishing process to deliver manufactured pieces
- A category of prototyping is included as some foundries provide the service of prototyping pieces by lost wax method.

Forges

- Forging is the set of processes that give shape to a material deforming it by applying pressure on it; typically forging is performed after foundry to elaborate raw materials
- The market in Forges is given by the final shape of the raw material that result from a process, which basically can be Sheets, Plates, Springs, Wires and Profiles or mesh, they are typically provided in steel, but some of the suppliers also provide other metals as cooper or zinc.

Additive Manufacturing

- According to the ISO/ASTM52921-1 “Standard Terminology for Additive Manufacturing – Coordinate Systems and Test Methodologies”, Additive Manufacturing (AM) is the process of joining materials to make parts from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing and formative manufacturing methodologies.
- The word Additive Manufacturing is frequently associated – in non-technical context - to “3D printing”, as the fabrication of objects through the deposition of a material using a print head, nozzle, or another printer technology; until present times this term has in particular been associated with machines that are low end in price and / or overall capacity.
- 3D Prototyping refers mainly to the construction of prototypes and manufacture of a small amount of units.
- 3D Modelling refers to the engineering/design activities performed through a computer prior to any physical printing
- Different Additive Manufacturing processes apply: extrusion, jetting, binder jetting, sheet lamination, photopolymerization, power bed fusion / sintering, direct energy deposition
- Competition in the market changes based on the type of materials: Metals (Stainless Steel, Steel, Titanium, Gold, Silver) vs Plastics (Acrylonitile butadiene styrene (ABS), Polylactic acid (PLA), Polyvinyl alcohol (PVA), Polycarbonate, ...) vs Other (e.g. Bio-ink, Glass, ...)

Welding

- Welding is the process that joins materials by melting the base material and typically adding new material that once cooled makes forms the joint
- Welding in usually used when building plants to connect all the pipelines and to build the equipment that must be finished in field such as tanks and big columns, also is common in the joint of civil structures
- Welding capabilities are given not by the material to be welded but by the method used to perform the activity and that is the differentiating point in the market.
- SMAW/SAW are methods of welding in which the electrode is covered by a flux which brings protection to the weld from environmental protection
- MIG/TIG or GMAW and GTAW are methods of welding that weld by using an electrode covered by a flow of inert gas to protect the weld from environmental contamination and use similar equipment
- Other methods include less common methods such as electroslag and electric resistance welding
- There is no incidence in the energy source to perform the welding, although many sources are possible, what differentiates competition is the welding method
- Related categories included in other Groups
  - Cladding category, even though the physical process may seem close to welding, it’s final goal is not joining pieces but coating, so it’s been considered within the Group’s 34 Family
  - Weld Overlay is considered as part of Group’s 34 Category Cladding as it is used as a coating and most of the competitors that are able to perform Cladding, can do Weld Overlay