

Manufacturing Cost Models

Physics-Based Mechanistic Cost Models

DATA SHEET

aPriori's physics-based cost models address common manufacturing processes including sheet metal fabrication, bar & tube fabrication, welded or mechanical assemblies, plastic molding, sand and die casting, forging, turning and multi-axis machining, and a wide variety of heat treatments and surface treatment or finishing operations.

Deterministic routings generate the lowest cost production method and evaluate the manufacturability of all routings defined in the **digital factory**. This allows engineering, manufacturing and purchasing professionals to explore cost saving production alternatives down to the machine level.

Cost Model Groups	aPriori Manufacturing Cost Models	Additional Processes which can be Delivered By Professional Services*
Sheetmetal – Soft Tooled Process	Cut-to-Length, Shear, Oxyfuel/Plasma/Laser/Waterjet Cutting, Turret Press, Plasma-Punch, Laser-Punch, Bend Brake, 2- 3- and 4- Roller Bending, Deslag	Straightening, Flame-Cut Beveling, Bump Bending, Laser Etching
Sheetmetal – Basic Stamping	Stage Tooling, Standard Press, 3D Laser	
Sheetmetal – Progressive Die Stamping	Progressive Die, Partial Progressive Die	
Sheetmetal – Transfer Die Stamping	Transfer Die, Offline Blanking	Inline Blanking
Sheetmetal Stretch Forming	Stretch Forming, Simple, Tangential, Transverse, Longitudinal	
Sheetmetal – Hydroforming	Fluid Cell Sheet Hydroforming, Deep Draw Sheet Hydroforming	
Bar & Tube Fabrication	Reciprocating/Band/Circular Sawing, Shear, Tube Laser, Punching, Rotary Draw, Compression, Bend Brake, 2- 3- and 4- Roller Bending, End Treatments: Bar Forming, Expansion, Flanging, Flaring, Flattening, Knurling, Notching, Reduction, Slotting	
Aluminum Extrusion Fabrication	Die and Billet Preheating, Release Agent Application, Cooling, Rough Cutoff, Straightening, Racking, Aging, Secondary Material Removal	
Casting I	Sand Casting	
Casting II	High Pressure Die Casting, Gravity Die Casting (aka Permanent Mold Casting)	Investment Casting
Plastic Molding	Single Shot Injection Molding, Structural Foam Molding, Reaction Injection Molding	Rubber Molding
Roto/Blow Molding	Rotational Molding, Blow Molding	
Sheet Plastic – Thermoforming	Vacuum Forming, Drape Molding	
Powder Metal	Compaction Pressing, Furnace Sintering	
Forging	Closed Die Hammer Forging	Open Die Hammer Forging, Rolled Ring Forging
Additive Manufacturing	SLA, SLS, Material Jetting, DMLS	SLM

Cost Model Groups	aPriori Manufacturing Cost Models	Additional Processes which can be Delivered By Professional Services*
Machining – General Milling	CNC 3-axis Milling, CNC 4-axis Milling, CNC 5-axis Milling, Sawing/Cut-to-Length, Gun Drilling, Wire EDM, Drill Press, Deburring, Assembly Milling (User-Guided), Jig Boring	Vertical & Horizontal Boring, Flow Drill, Lapping
Machining – General Turning	CNC Turning: 2-axis & 3-axis conventional lathes, 2-axis & 3-axis bar feed lathes, Mill-Turn, Deep Bore/Trepanning, Lathe Roughing (on castings), Lathe Finishing, Single Point Threading, Single Plunge Grooving, Multi-Plunge Grooving	Graphite Milling, Fine Thread Making
Machining – General Grinding	OD Grinding, ID Grinding, Surface Grinding, Rotor Grinding, Jig Grinding, Cylindrical Grinding	Honing, Polishing, Jitterbug Sanding, Single Index Milling
Gear Making	Hobbing, Shaping, Broaching, Rolling, Bevel Gear Cutting, Shaving, Profile Grinding, Threaded Wheel Grinding, Spline Rolling	
Printed Circuit Board Assembly	Component Preparation, Surface Mount Assembly (single and double sided), Plated Through Hole Assembly, General Assembly (Conformal Coat, Depanelization, etc.), Testing. See aPriori Electronics Cost Modules datasheet for specifics	Component Library
Wire Harness	Wire/Bundle/Conduit Prep, Wire Termination, Connector Assembly, Splice, Branch Covering, Braid, Harness Layout, Labeling, Testing. See aPriori Electronics Cost Modules datasheet for specifics	Wire Harness Data Table Loader, Component Library
Assembly Welding & Bonding	Weld Preparation, Manual MIG Welding, Manual Spot Welding, Robotic MIG Welding, Robotic Spot Welding, TIG Welding, Weld Cleanup, Welding on Parts, Laser Welding, Electro-Beam Welding, Adhesive Bonding	Resistance, Ultrasonic and Friction Welding, Brazing, Soldering,
Mechanical Assembly	Manual Screw, Power Screw, Press Fit, Snap Fit, Rivet, Tab Bend, Nut Insert, Pick & Place, Helicoil Insertion, Lock Bolt	Grease Packing, Wire Routing; Most Mechanical Assembly Procedures
Assembly Molding	Insert Molding, Over molding	
Chemical Milling	Cleaning, Identing, Masking Operations (Spraying, Curing, Scribing, Line Sealing, Spark Testing, Removal), Etch Cycle Operations (Mask Peeling, Etching, Rinsing, Depth Inspection), Final Inspection	
Heat Treatment	Aging, Annealing (3 types), Cryogenic Freezing, Solutioning, Stress Relieving, Surface Hardening (3 types), Tempering (2 types) Through Hardening (4 types), Hot Isostatic Pressing	Normalization, Chromizing, Borizing; Most Heat Treatments—both whole part and localized
Surface Treatment	Shot Blast, Degreasing, Basic Painting (e.g., cost per surface area), Powder-Coat Car Painting, Wet-Coat Line Painting, One-Sided Fraction Painting, Plating (4 types), Silk Screening, Passivation, Vibratory Deburr	Chem Film, Booth Painting, Protective Coat; Most Surface Treatments—both whole part and localized
Anodizing	Types I, IB, IC, II, IIB (“thin sulfuric” anodizing), and III (“hard coat” anodizing)	
Cleaning, Testing & Inspection	CT Scan, Fluorescent Penetrant Testing, Magnetic Penetrant Testing, Hydrostatic Leak Testing, X-ray Inspection, Ultrasonic Cleaning, CMM In Process Inspection for Sand Casting, Permanent Mold Casting included with Casting I and II	Final Inspection, Most Inspections—both whole part and localized
Packaging	Carton Forming, Pack & Load (wrapping, bagging), Carton Sealing	Truck Loading, Bag & Tag, Intrim-State Packaging, Cleanroom Packaging; Most Packaging Models
Logistics		Transportation
User-Guided Processes (for costing without CAD)	Turret Press, Bend Brake, Stage Tooling, Progressive Die, Injection Molding	

2-Model Comparison – enables costing machined parts by comparing an “as designed” raw casting or forging model to the final, “as machined” part model. Customer must also be licensed to the manufacturing cost models used to cost a part (e.g., machining, casting, forging, etc.).

*Additional cost required to develop and deliver the processes listed in the third column of the table above. The aPriori Professional Services team may also be able to deliver processes not in this list after evaluating the requested processes and confirming the capability to develop a solution.



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