ENGR480 Manufacturing Systems

Spring 2007

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- *MWF 10:00, Lab Tue 2:00*
- Read Syllabus for other info

What is Manufacturing?

- Man-u-fac-ture: To make or process a raw material into a finished product, esp. by means of a large-scale industrial operation.
- From Latin manu + factus: by hand, to make



Manufacturing Operations

- Processing
 - Shaping (solidification, deformation, material removal, or particulate processing)
 - Property Enhancement (heat treatment)
 - Surface Processing (cleaning, coating)
- Assembly
 - Permanent (welding, adhesive, rivets, pressfit)
 - *Reversible (threaded fasteners, friction fit)*

Short History of Manufacturing

- 3000BC: Egyptian and Korean sand casting
- 1000BC: Iron age began
- 26BC: Egyptian lathe turning
- 1770AD: Steam engine, industrial revolution
- 1801: Interchangeable parts
- 1911: F.W.Taylor's "Principles of Scientific Management", Henry Ford's mass production
- 1965: Toyota Production System, single-piece flow
- 2000: Virtual corporations, global manufacturing

Our Manufacturing Company

- You thought this was a class it's really a manufacturing company (we'll call it **MotorMakers Inc**)
- Our products are small brushless outrunner electric motors.



Some Questions a Manufacturer Needs Answered

- Who is going to buy our product?
- How much will they pay for it?
- How much quality will we put into it?
- How much will it cost to make?
- How much money will we make?
- What will making this product do to the Earth?

The Next Questions

- Will we make 1 or 1,000,000 units?
- Should this product be durable or disposable?
- What will be our production schedule?
- How long can development take?
- How much should we invest in production efficiency for this product?



Case History: Forge Industrial

- Cement and sand bagging plant
- Manual palletizing:
 - 120 pallets/day, 56 bags/pallet,
 60 lb/bag = 400,000 lb/day
 - Crew of 4 (work release), changed twice/day
- Automatic palletizer
 - 200 pallets/day (672,000 lb/day, 68% increase)

Our Product

- 19 part electric motors
- Production Rate Goal of 5 minutes / motor
- Bill of materials is:
 - (1) GoBrushless.com S-227-45-9 22.7mm 9-pole stator
 - (1) GoBrushless.com BS-1 Stock bearing assembly
 - (1) GoBrushless.com C-22 Rotor can
 - (14) GoBrushless.com M5-5-1 N50 magnets
 - (2) GoBrushless.com B-3625-10 3mm ball bearings
 - OemWire.com 43779 26 AWG wire

Basic Steps in Motor Assembly

- Wind stator
- Insert bearing tube in stator
- Insert bearings and shaft in stator
- Place magnets in can
- Press can onto shaft

