Open Die Forging, Heat Treating & Machining

MADE IN AMERICA

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ACKNOWLEDGMENTS

• The story I am about to share is a journey of our organization and not about an individual.

• The achieved results and vision forward could not have been accomplished without the combined efforts, open minded attitudes, and hard work from everyone associated with this project.

• It truly has been rewarding to see the various groups of employees / individuals coming together to drive Forge USA forward as one team.
WHAT IS FORGING?

• A manufacturing process involving the shaping of metal using localized compressive forces.
• Often classified according to the temperature at which it is performed: cold forging (a type of cold working), warm forging, or hot forging (a type of hot working).
  • For the latter two, the metal is heated, usually in a forge.
• Parts can range in weight from < 1 kg to 100’s of metric tons.
• Done by smiths for millennia;
  • Traditional products were kitchenware, hardware, hand tools, edged weapons, and jewelry.
• Since the Industrial Revolution, forged parts are widely used in mechanisms and machines wherever a component requires high strength (automotive, airplanes, power generation, O&G, etc)
  • Usually require further processing (such as machining) to achieve a finished part. Today, forging is a major worldwide industry.
OUR FACILITIES

- Forge Shop built in 1948
- Originally Gulf Forge
- 1973 - Bought by former Executive of Cameron Iron Works (Jerry W. Brougher)
- 1993 - Sold to Alberta Forge, renamed Alberta Texas Forge
- 1999 - Bought by father and son (Jerry and Wade Brougher)
- 2001 - Renamed Forge USA
- Owned and/or operated by Brougher family for 40 years
OUR FACILITIES

- 260,000 Square Foot Forge / Heat Treat Production Facility Located in Houston, TX (98 Employees)

- 125,000 Square Foot Rough Machining Facility Located in Brookshire, TX (50 Employees)
Alberta Texas Forge, 1993-2001

Forge USA, 2001 - Present
2000 TON PRESS
HEAT TREAT PROCESS
BROOKSHIRE, TX
NDE (NON-DESTRUCTION EVALUATION) TESTING
TYPICAL PROCESS ROUTING

- Raw material procurement (outside resource)
- Initial cogging / blooming of ingot
- Saw cut individual pieces
- Finish forge to size
- Ship to machine shop
- Machine to customer configuration
- Ship to forge shop
- Heat treat
- Mechanical testing (samples sent outside)
- Non-Destructive testing (hardness, UT, mag)
- Final certification and release for shipment
- Shipping

- There can be more than 40 routing steps for one part, taking up to 12 weeks
CHALLENGES PRIOR TO THE IMPLEMENTATION

• Both facilities were run independently from each other

• Silo effect between Sales and Operations

• Operations didn’t have the proper tools to execute

• No formal system schedule – all done using pencil / paper

• Multiple opportunities for murphy / late deliveries
CHALLENGES PRIOR TO THE IMPLEMENTATION

• Lack of visibility and consistency

• Implementation of new ERP system

• Cultural shift away from shipping dollars to focus on product flow / on-time delivery

• O&G market was booming and we lost opportunities for new business
WHY THE DEMAND DRIVEN APPROACH

• Prior experience with a SDBR system in a similar manufacturing environment that yielded excellent results

• Practical market knowledge that high due date performance would generate more opportunities for Forge USA and smooth out the roller coaster effect of the O&G market swings
  • Open die forging industry historically has poor OTD

• Believed it would provide a platform to develop stable operations and scheduling visibility

• We wanted a complete visible system designed for flow from “Quote to Cash”
TIMELINE OF IMPLEMENTATION

- 10/13: MJM joined Forge USA
- 12/13: Initial DBR+ discussions with top management
- 1/14: Decision made to move forward
- 4/14: Went live with system
- 6/14: Went live with Production Planning reorganization
- 4/14 - 7/14: Learned to run the system and stabilize
- 7/14: 1st Audit and refocus with new PRT
- 9/14: 2nd Audit and refocus with new PRT
- 12/14: Time to remodel again – to what and why?
- 1/15: Began to lay foundation to remove packet scheduling
- 3/24: Going live with remodel
IMPLEMENTATION MODELS

• PACKET SCHEDULING
  - Created decoupling points between a group of key operations (“phantoms”) and facilities to reduce variation
  - Culturally not ready to look at manufacturing flow as a continuous sequence
  - Enabled opportunity to refine routings prior to release of a specific packet leg
  - Provided performance metrics by “phantom” (forge, machine, etc)
  - Allowed creation of an executable schedule

• R+
  - Material availability is key to starting the orders on-time, which is critical to completing on-time.
  - Looking for opportunities to reduce inventory while maintaining availability
RESULTS

• Production planning went from ~ 3 weeks to 1-2 days

• OTD to the schedule went from ~ 50% to 90+%%

• OTD to our customers went from ~ 40% to mid 70’s%

• Reduced average days late from 30 to < 5

• Developed a much better understanding of our capacity and what limits us from increasing flow.

• Managing the drums the best we ever have

• Created visibility into the manufacturing process.
RESULTS

• Developed a lead time calculator allowing us to quote realistic and reliable Due Dates to our customers
  ❖ Accounts for existing load versus available capacity

• Changing culture to everyone working from one schedule with set priorities based on the end goal of customer on-time delivery

• Creating a sustainable system that is easily transferable and bigger than any one individual

• Our performance is opening new Sales opportunities

• Reinforces the drive for continuous improvements throughout the organization

• Increased visibility to the right information has increased communication / teamwork among departments
LESSONS LEARNED

• There is no such thing as a perfect implementation or the perfect system!

• Don’t implement a new ERP system at the same time as DBR+!

• The process truly is on-going, and the better you become the more often you are improving the system. There is no finish line!

• Culture takes time to change

• We need everyone pulling together in the same direction with the same system to achieve the results
LESSONS LEARNED

• We learned about challenges within other departments to manufacture a product

• How to manage the drums and increase flow

• The drum really is the beat for that given product line which means idle capacity may be a good thing

• We have the capability to process more products with the same equipment / manpower than we ever thought possible in the past (record months)

• We can actually look ahead and plan for overtime and plan between departments or specific operations for the needed flexibility instead of reacting at the last minute
NEXT STEPS – NEW MODEL – Remove Packets

CURRENT MODEL OVERVIEW – PACKET SCHEDULING

NEW MODEL OVERVIEW – NO PACKETS

Drum Buffers remain measurement point


New small Buffer at Brinell. Measures specific HT resource performance, not entire department.

Shipping Buffer is the only Final Buffer and remains a measurement point. No Completion Buffer.

New Buffered Resources: “(dept) Done”. Critical system entry and exit measurement points. No time at operation.

WO Release & then Close
NEXT STEPS – EXPECTED RESULTS

• Remodel to remove packets

• Will significantly reduce / eliminate the need for re-releasing orders
  ◆ Greater Schedule Stability / Reliability

• Will provide better visibility / accountability to overall performance while still maintaining our ability to measure execution at the “phantom” level

• Expedited orders will be used on as the exception

• Orders will show late once we miss customer commitment dates even if we are on-schedule within a given set of operations.
  ◆ Original due dates will remain, holding us to a higher standard.

• Enable increased adherence to the schedule as we move towards achieving our goal of 95+% on-time to our originally committed customer due date
  ◆ Critical for sales and profit increases
QUESTIONS & ANSWERS?