# 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.


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# 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

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# 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 )**

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## Alberta Texas Forge, 1993-2001


## Forge USA, 2001 - Present


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# 2000 TON PRESS


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# MANDREL PUNCHED CYLINDER

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# HEAT TREAT PROCESS

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# BROOKSHIRE, TX


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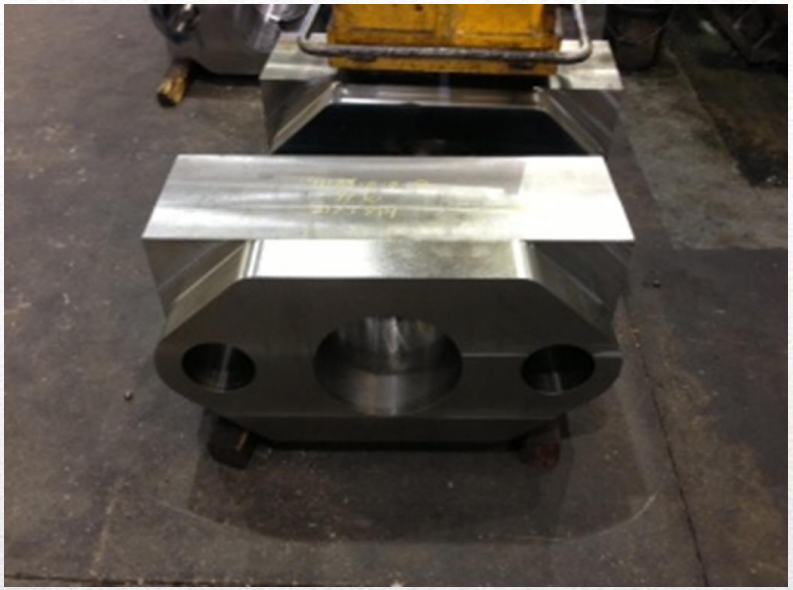

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# TITANIUM ON BETTS LATHE

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# VERTICAL TURRET LATHE

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# STEP SHAFT

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# FLANGE BY FLANGE SINGLE BOP


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# NDE (NON-DESTRUCTION EVALUATION) TESTING


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# 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

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# 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

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# 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

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# 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.

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# 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

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# 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

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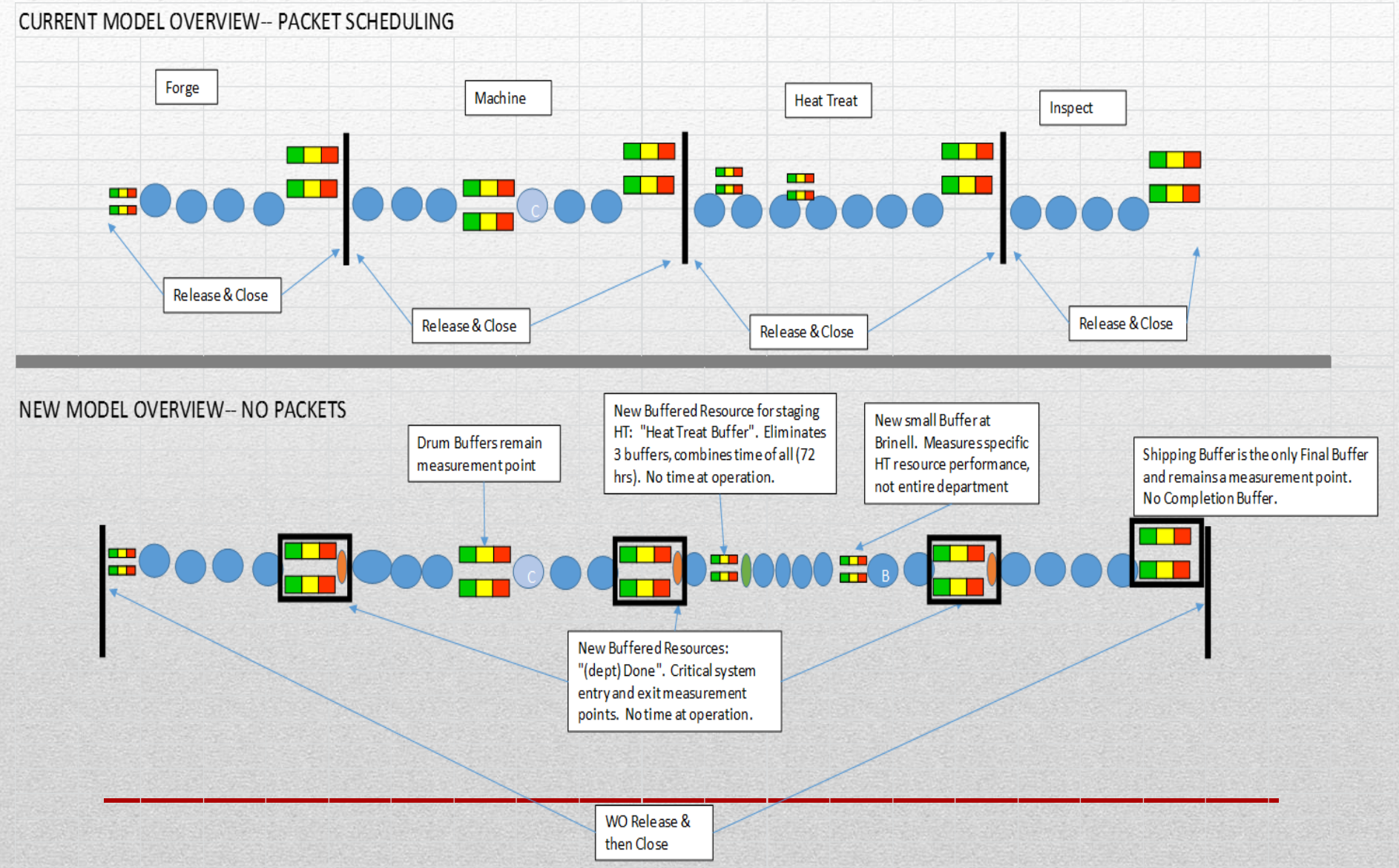
# LESSONS LEARNED

- 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



# 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

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# QUESTIONS & ANSWERS?