

# CHALLENGES IN HEAVY MANUFACTURING

## PART II: FLEXIBLE MANUFACTURING

**EWI**<sup>®</sup>  
*We Manufacture Innovation*



# WHY FLEXIBLE MANUFACTURING?

Manufacturers can ensure consistently high quality, increase processing speed, and reduce costs with flexible manufacturing. Integrating agile production technology on the factory floor enables manufacturers to quickly respond to changes, whether those changes are planned or unplanned. It is well suited for high mix production at both low and high volumes.

## BENEFITS OF FLEXIBLE MANUFACTURING PROCESSES:

- Little or no downtime
- Improved quality
- Less customization needed
- Shorter cycle times
- Increased labor productivity



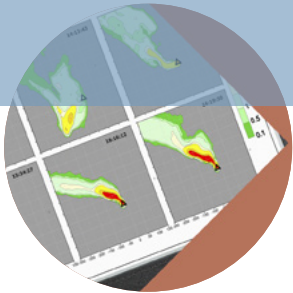
# COBOTS

Cobots, or collaborative robots, offer new possibilities in manufacturing. These robots work side by side with their human coworkers while posing no safety risk. While tooling up, integration, and safety costs make many industrial robots very expensive, cobots cost significantly less, providing a greater ROI. Because they are easy to reprogram, they allow for great manufacturing flexibility.



# MANUFACTURING SIMULATION

Simulating a production system allows manufacturers to determine if a process will be a worthwhile investment. It is a risk-free and inexpensive way to test parameters and optimize processes in order to develop a robust and validated system.



## FEASIBILITY PILOT FACTORY FLOOR

EWI has developed the **Feasibility Pilot Factory Floor** for flexible automation. It is a unique manufacturing toolbox that includes robots, systems, and software that clients can choose from to test and validate processes before investing in hardware.

## MANUFACTURING SIMULATION

### TOOLS:

**DELMIA:** Simulates production cell automation for a single cell

**FlexSim:** Factory simulation software, simulates the entire process within the entire factory



## EWI'S UNIQUE CAPABILITIES

EWI develops custom fully-automated adaptive welding systems. By combining commercially available measurement tools with our algorithms, these systems are able to accommodate joint variations without operator input. After gathering joint measurements, the welding parameters and robot path are adjusted based on a dynamic joint fill plan. For multi-bead welds, this process repeats, allowing continual adjustment based on the updated joint geometry.

## ADAPTIVE WELDING

Varying fit-up tolerances, volumetrically changing weld joints, and complex geometries represent a significant challenge in the automation of many heavy fabrication welds. Off-the-shelf systems locate the weld joint using lasers, cameras, or touch sensing, and welding parameters are adjusted based on the

sensed joint size. Operator input is often required to select from predefined weld paths and adjust welding parameters. No commercially available off-the-shelf system has the ability to plan and continuously correct the welding fill sequence for these multi-bead multi-layer welds.

# Up Next: PART III IMPROVING FATIGUE LIFE



## ABOUT EWI

EWI's extensive work with predictive modeling and simulation, as well as next generation advanced high strength steels (AHSS), advanced nondestructive evaluation (NDE), advanced welding and joining, emerging heavy fabrication technologies, and other innovations give our heavy manufacturing customers an upper hand in today's fiercely competitive market. To learn more about EWI's experience helping OEMs and suppliers in the heavy manufacturing industry use technology innovation to become more competitive, contact Aaron Haines, Market Segment Manager, at [ahaines@ewi.org](mailto:ahaines@ewi.org) or **614.688.5146**.

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