



A Day in the Life of an Automotive Manufacturer - BIW

Marcel Keinan
UGS Products
Manufacturing Solutions Group
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The Goal

- ▶ An introduction to the world of Digital Manufacturing
- ▶ Examine the Process Planning elements
- ▶ Look into the planning of the manufacturing process in the Body in White area





- ▶ Complexity increases
 - ▶ More product types on the same line
 - ▶ Higher demand for quality
 - ▶ OEM requires faster ROI for manufacturing lines
 - ▶ OEM requires to shorten process planning time
 - ▶ Faster ramp-up is mandatory
- ▶ Production must be cheaper
- ▶ An increasing number of new manufacturing and assembly technologies
- ▶ Increase automatization level





Quiz

How often is a new car produced in a factory?

- ▶ 60 hours
- ▶ 60 minutes
- ▶ 60 seconds



A production line



Elements of the Manufacturing Process

1. Operations
2. Resources
 - ▶ Human being
 - ▶ Robot
 - ▶ Tool
 - ▶ Tooling - Fixture, Clamp, Turntable
 - ▶ Control Device – Sensor, Valve, Piston
3. Parts
 - ▶ Instances
 - ▶ Mirrored
 - ▶ Variants
4. Manufacturing Features (MFG)







Welding of aluminum
in automotive production with
diode pumped solid state lasers
(AUDI A8)



What Is A Manufacturing Process ?



Tentative definition

A process is a sequence of operations

- ▶ Dealing with variants
- ▶ Parallelism

A better definition

A process is a program of operations

- ▶ Inputs, Outputs, Sequencing, Branching, Logic



The Importance of Designing the Manufacturing Process



- ▶ The efficient design of a manufacturing process leads to a shorter Time to Market
- ▶ An optimized cycle time leads to a shorter Time to Volume
 - ▶ Increased profitability at the early stages of the product introduction



The BIW Tour



Automotive Process

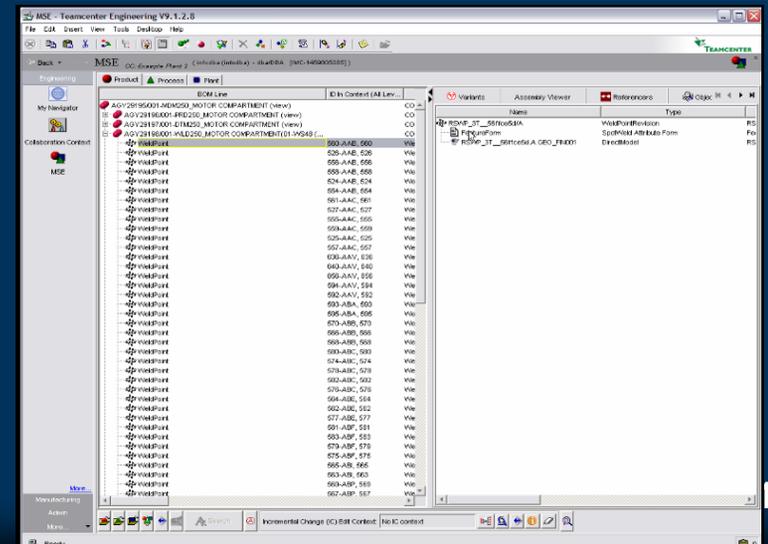
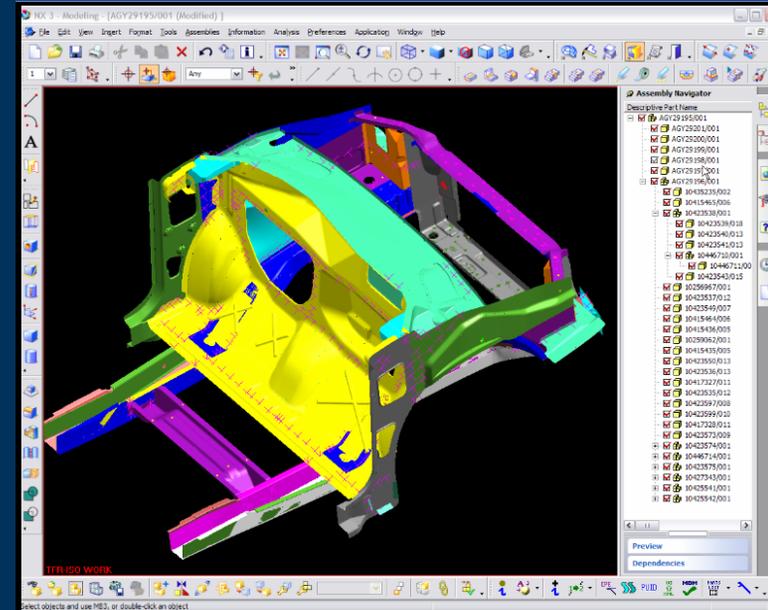




Getting The Data



- ▶ Getting the data
 - ▶ From the Design Department
 - ▶ From the existing manufacturing process
- ▶ Updating the data
 - ▶ BOM / MBOM
 - ▶ Parts / Assemblies
 - ▶ Lack of a PLM system with unique ids, also for instances
 - ▶ Finding the correct data
 - ▶ Figuring out the changes
 - ▶ Examine the implications to the current process

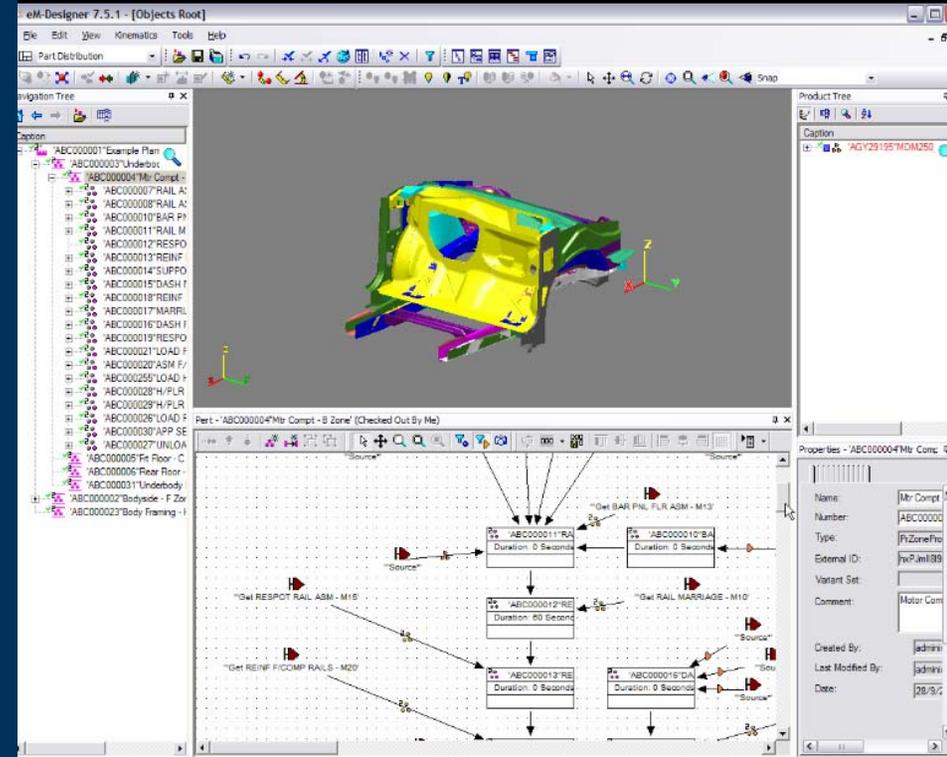




Pre-Planning

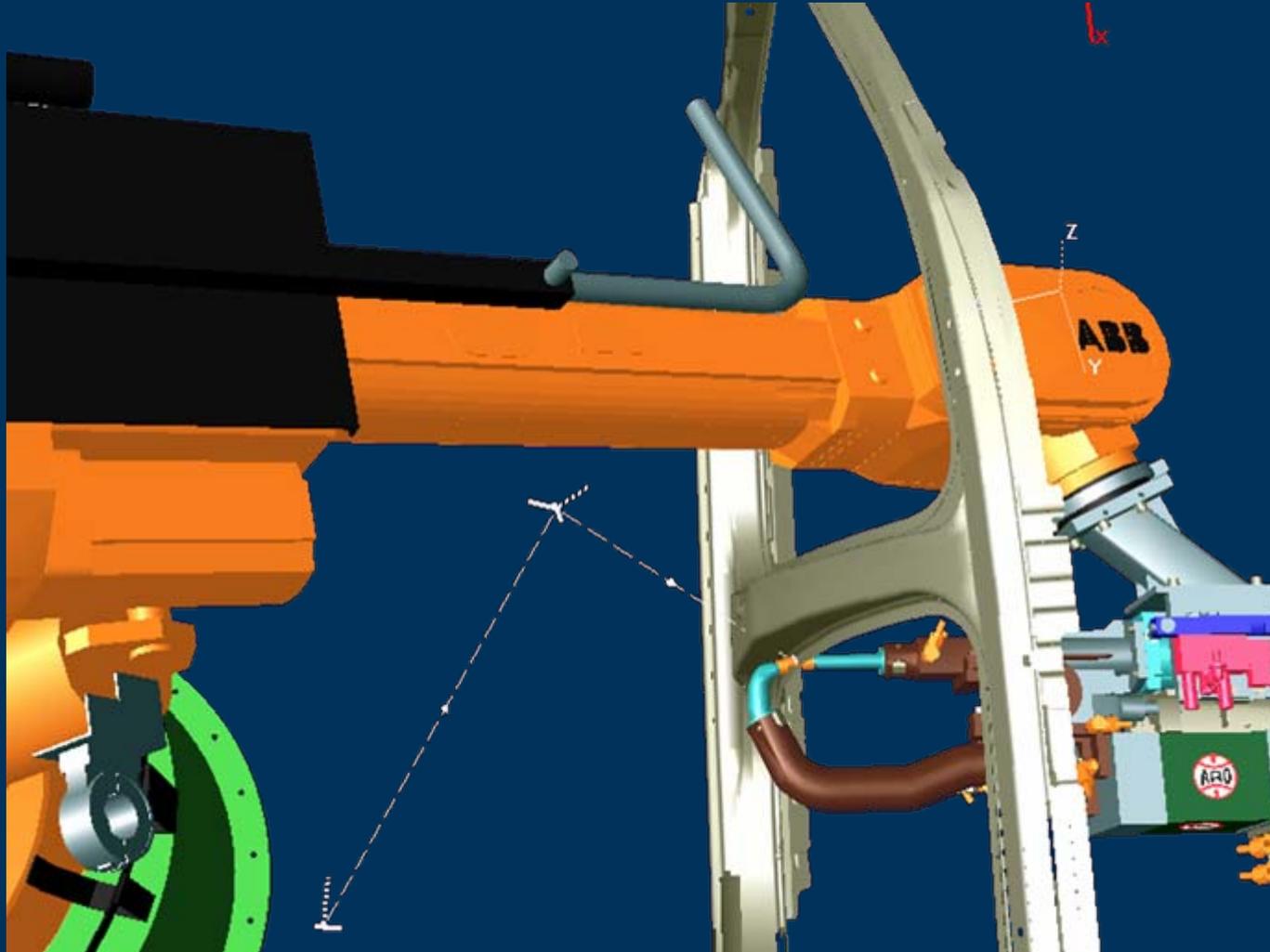


- ▶ Part assignment to stations
- ▶ Initial process definition
 - ▶ Where each part is consumed
 - ▶ Where each Manufacturing Feature is executed
- ▶ Preliminary cost definition



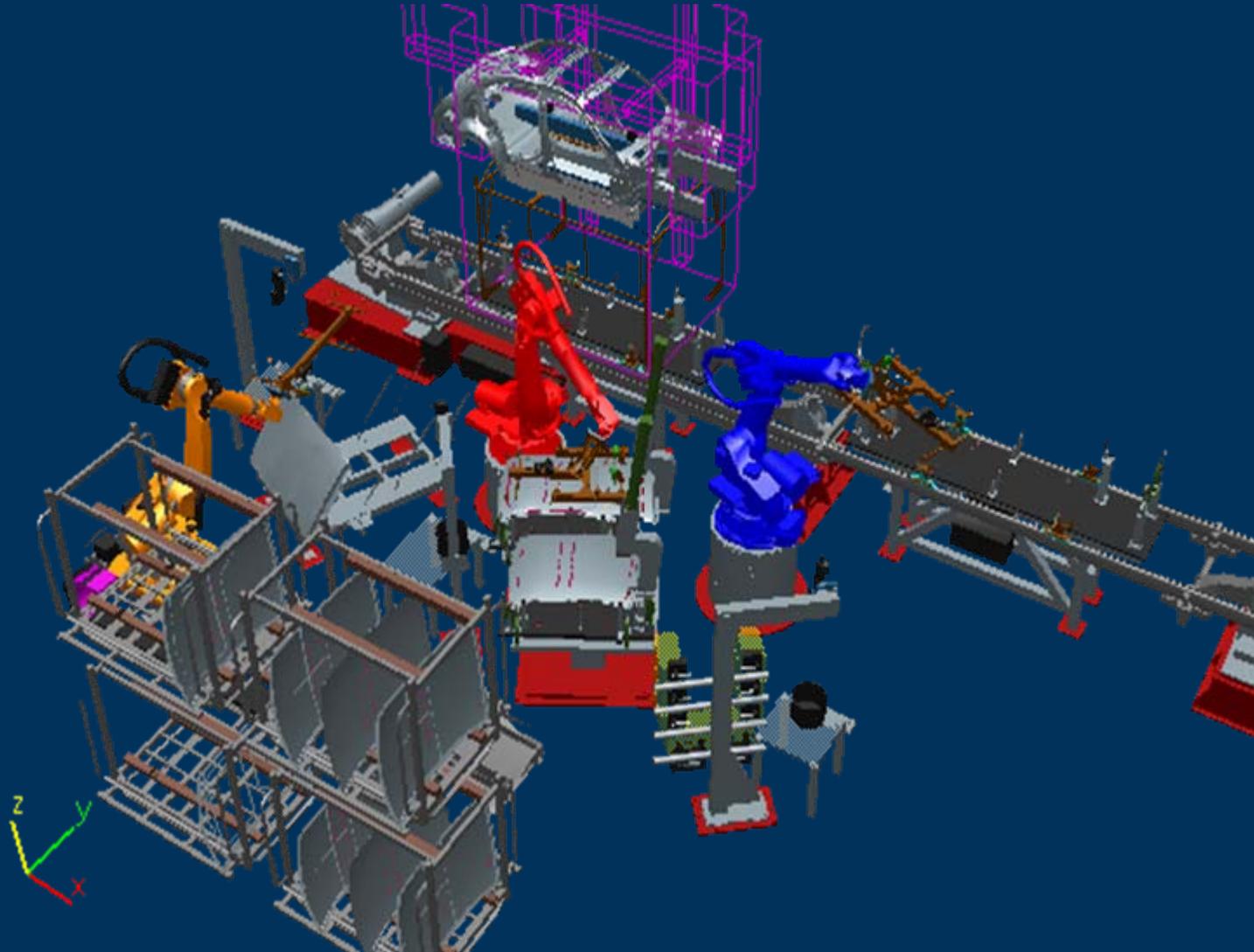


Collision Free Robot Paths





Station Synchronization





Logistics and Conveying





Simulating the Production Line





Business Results at GM



ROI: \$ 2.5M savings per BIW project



- ▶ Concurrent planning of BIW processes throughout extended enterprise (including suppliers)
- ▶ Reduced direct engineering efforts & costs in process development and validation
- ▶ Rationalized number of outsourcing partners
- ▶ Collaborate more effectively with outsource partners with collaborative data sharing (130 planners and 1500 distributed web-users)
- ▶ Deployed on every BIW project globally





Business Results at Audi

Major achievements



- ▶ Better quality

- ▶ Standardized workflow
- ▶ Usage of verified standardized libraries
- ▶ Better cost estimation
- ▶ Improved cycle time
- ▶ Standardized reports



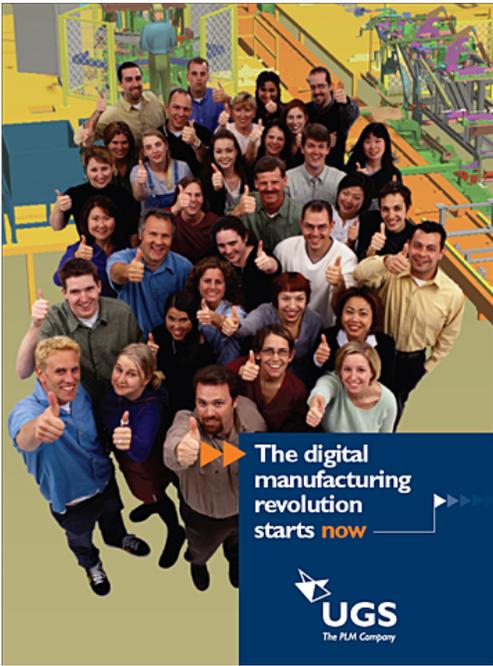
- ▶ Faster planning

- ▶ Creation of layouts in a very simple way
- ▶ Fast creation of alternatives → ~2 days relatively to ~2 weeks before using the UGS Tecnomatix tools

- ▶ Users' acceptance

- ▶ “Marketing” in SEAT done by Audi BiW people





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