



MacDonald Humfrey (Automation) Ltd
Specialists in Systems Integration

DRIVING A SHORTER LAUNCH CYCLE USING VIRTUAL COMMISSIONING



How many of you have heard the following statement recently?

“But that’s the way we have always done it.”

Our industry is changing



and it’s not just incrementally.



Producing a product a little more complex than a smart phone!



Dynamic complex global projects now exist

- Multi-disciplined teams
- Multiple locations
- Different time zones
- Different languages





Reach and Clearance



Off-Line Programming



Fixture Design

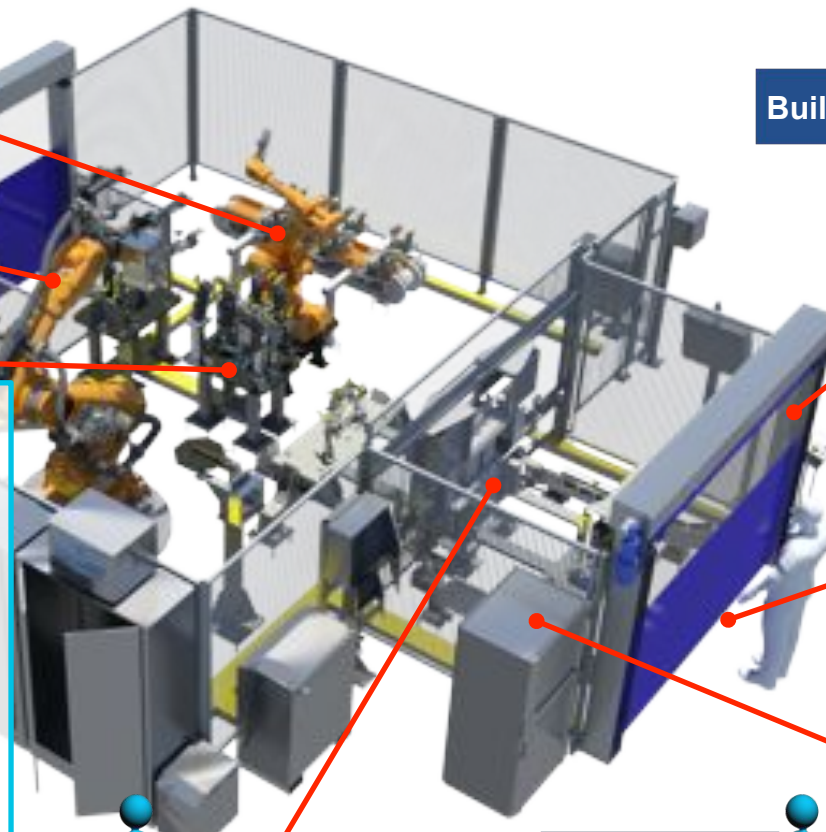
Complexity is the overwhelming challenge felt by product designers for new product development and introduction.

Source: The Aberdeen Group "The value of virtual simulation versus traditional methods"

December 2014



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Build Quality



Cycle Time/Throughput



Safety



Controls

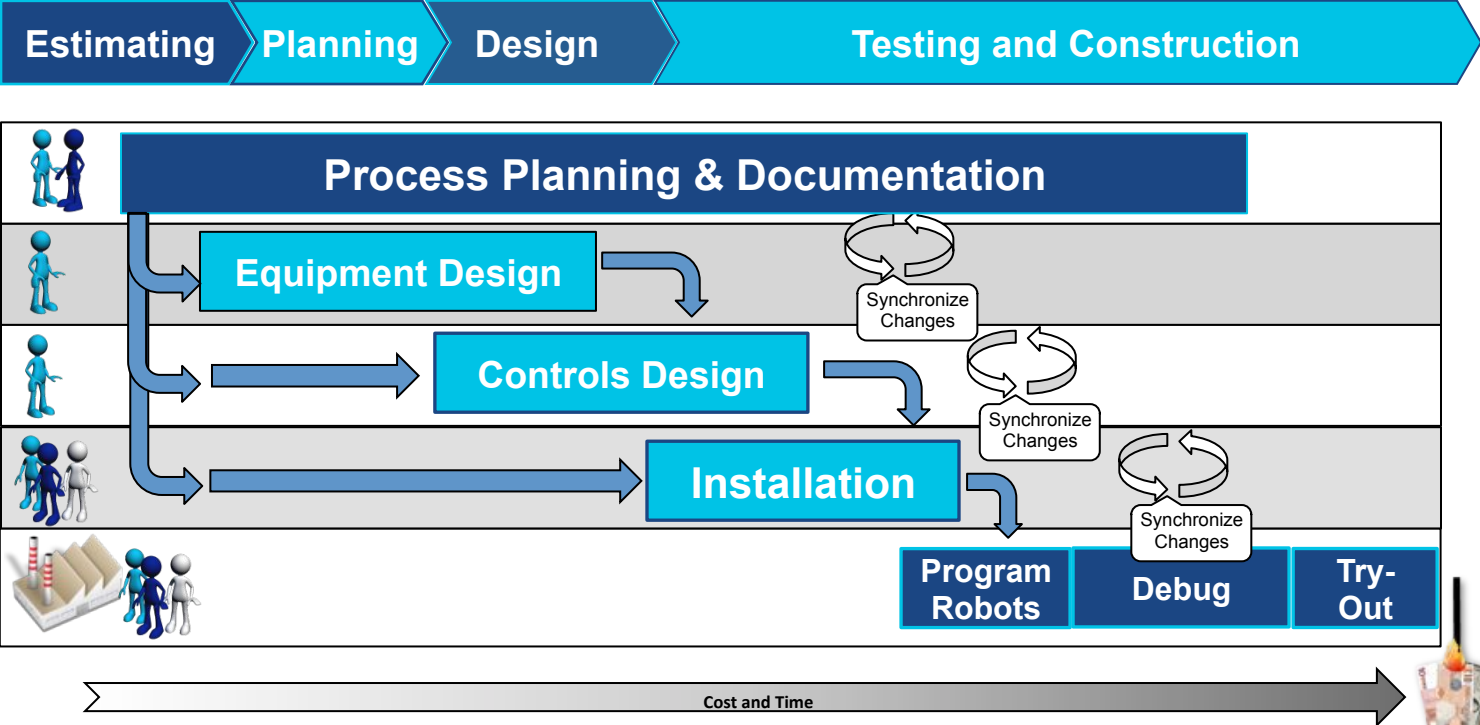


Product Design

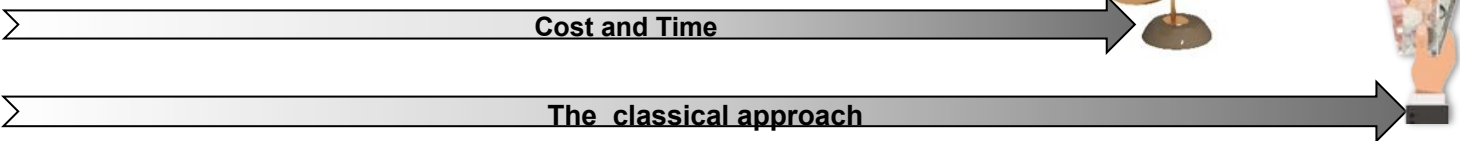
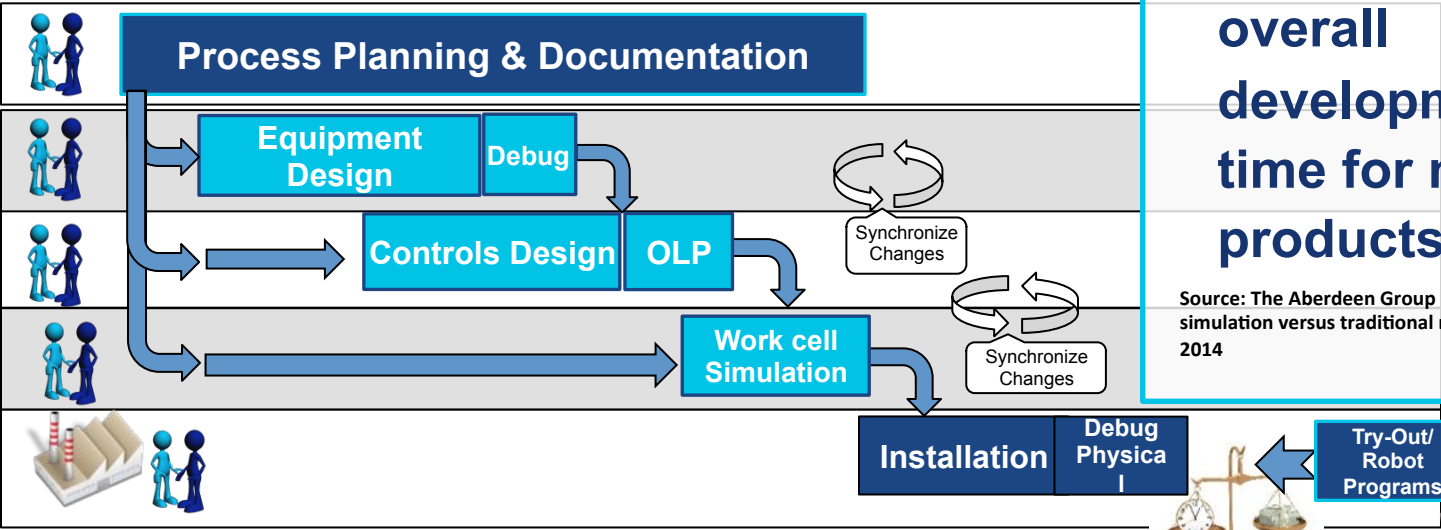


System Layout

The classical approach



The dynamic approach

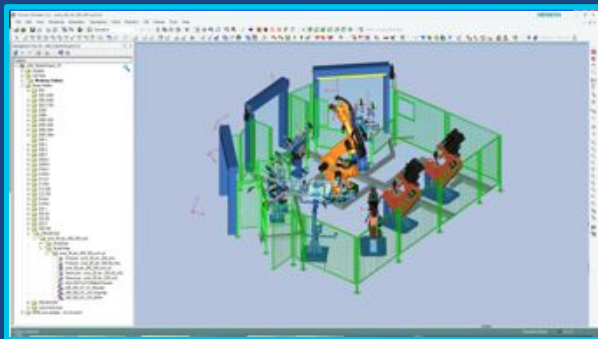


Virtual Simulation users saw a 16% decrease in overall development time for new products

Source: The Aberdeen Group "The value of virtual simulation versus traditional methods" December 2014

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Virtual



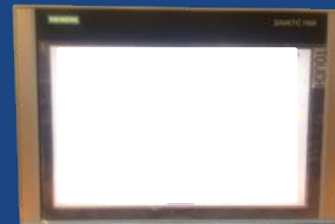
Real



PLC



HMI





“But that’s the way we have always done it.”

Change will continue to happen



Just ask Nokia,

Kodak, Blackberry, HMV or MySpace ...

A more complex product

= more complex facility

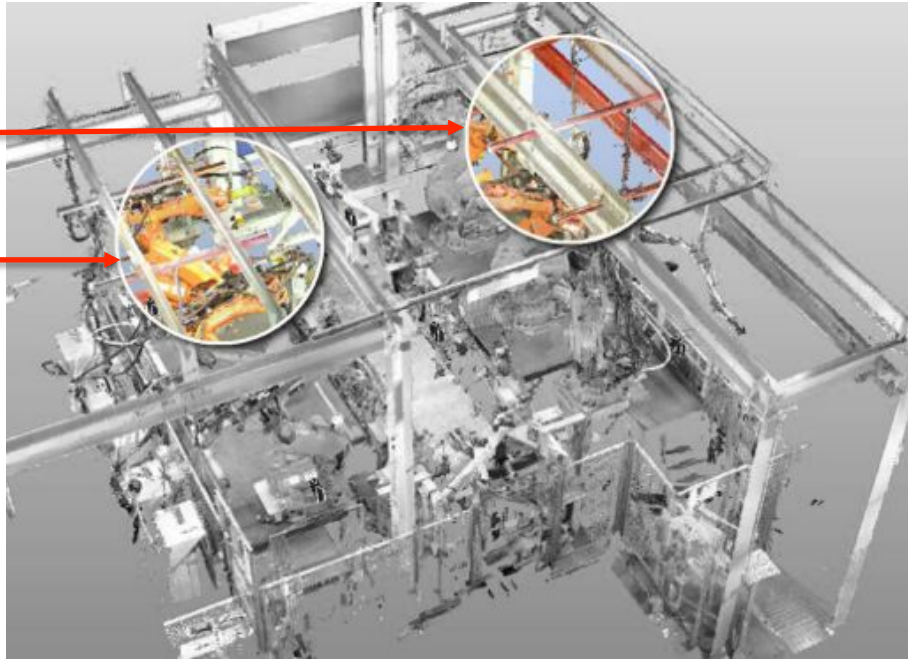
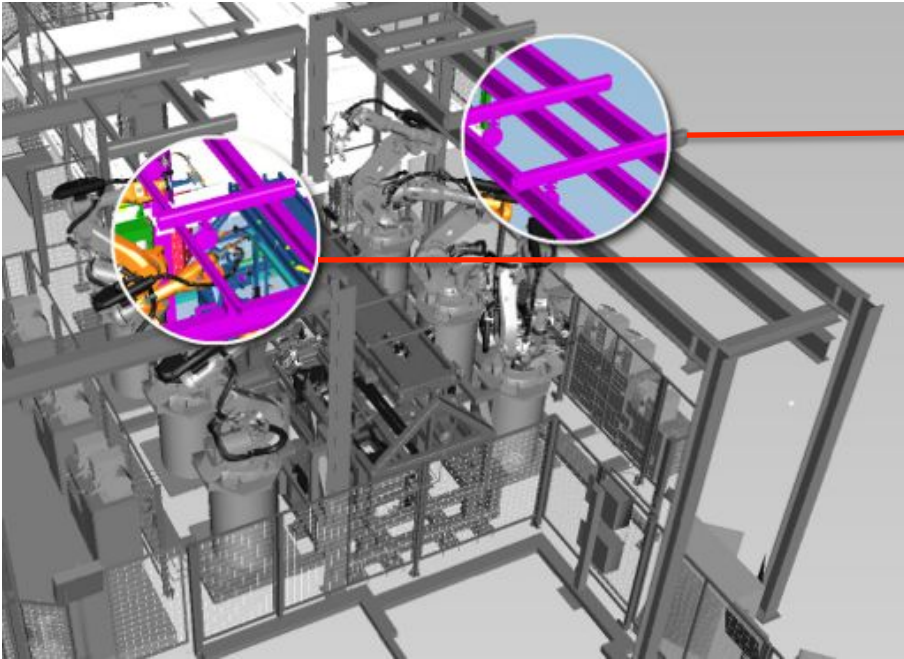
= more testing

= more time!

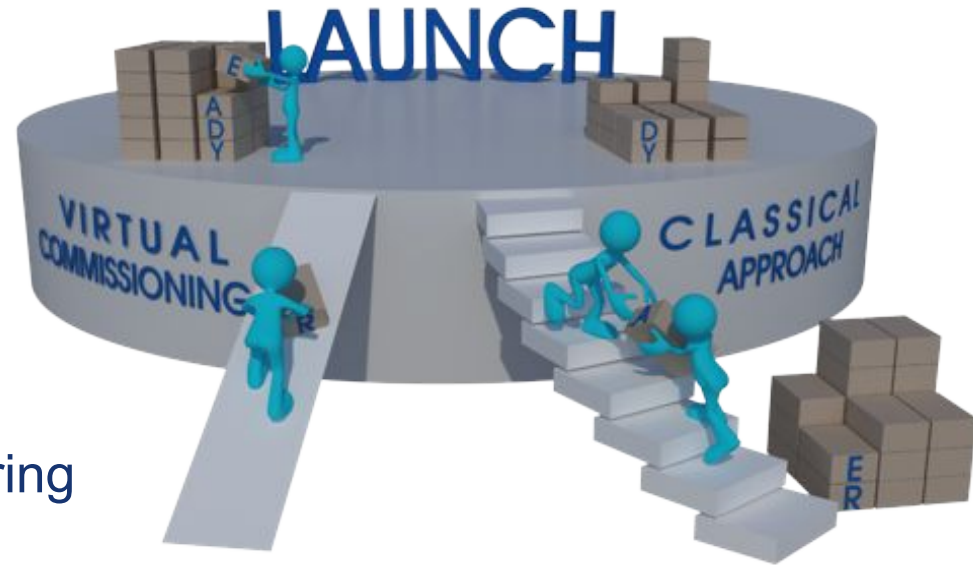


Our activities are now much more simultaneous

The digital world isn't the same as the real world for a variety of reasons.



- ✓ Right the first time
- ✓ Easier Proof of concept
- ✓ Faster Factual decision making
- ✓ Collaborative and Efficient Engineering
- ✓ Standardization of processes and components





Why is accuracy so important?



It is important that we work with the **facts**, not predicted **assumptions**.

As the complexity grows, so does the difficulty to predict or visualise the **questions**, **doubts** or **errors**.

We have found it best to use the actual PLCs and HMIs intended to control the final production facility for our emulation.



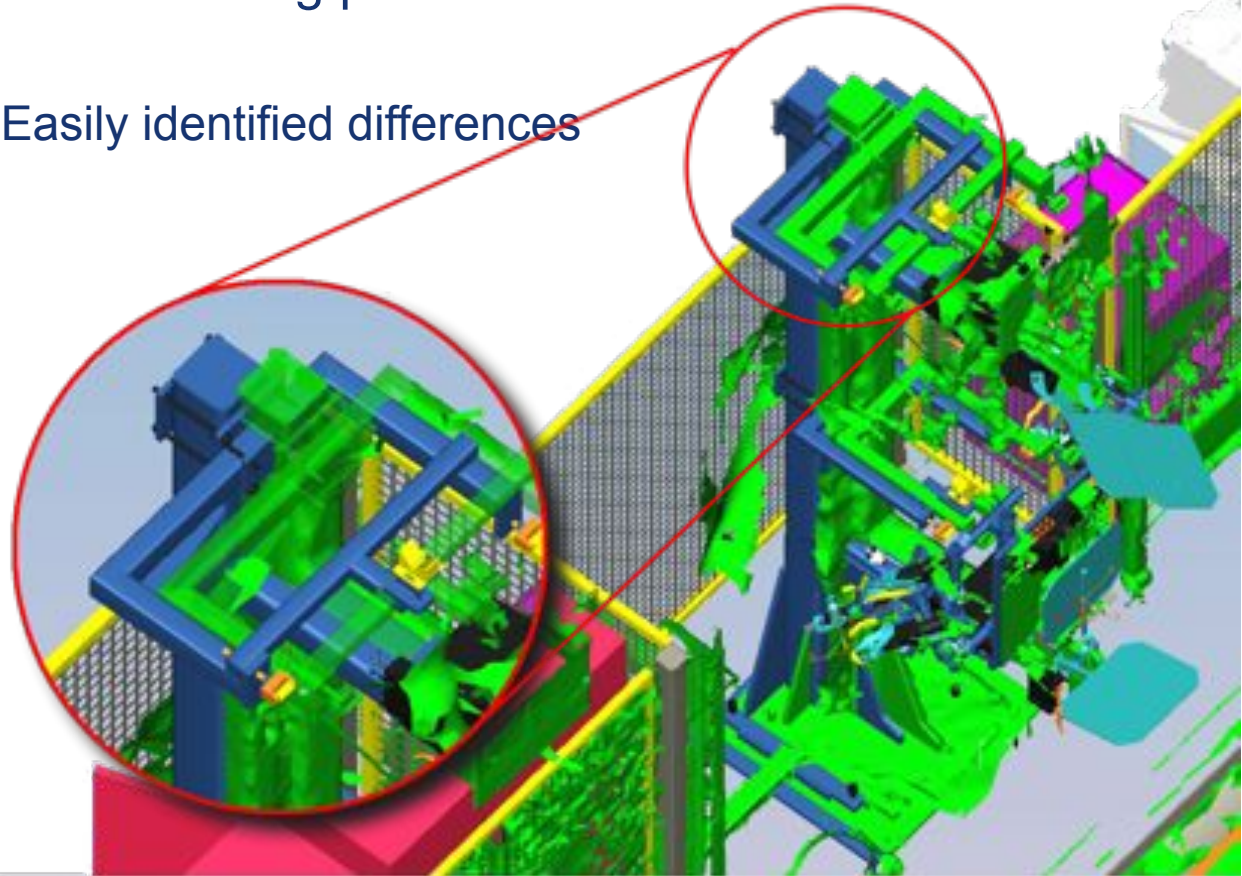
Enabling our customer to focus on the product launch not the facility commissioning.

An example of the visible difference using point cloud data

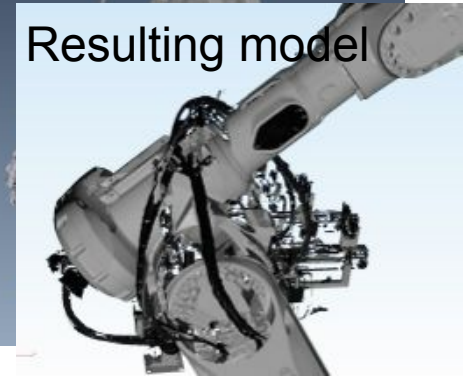
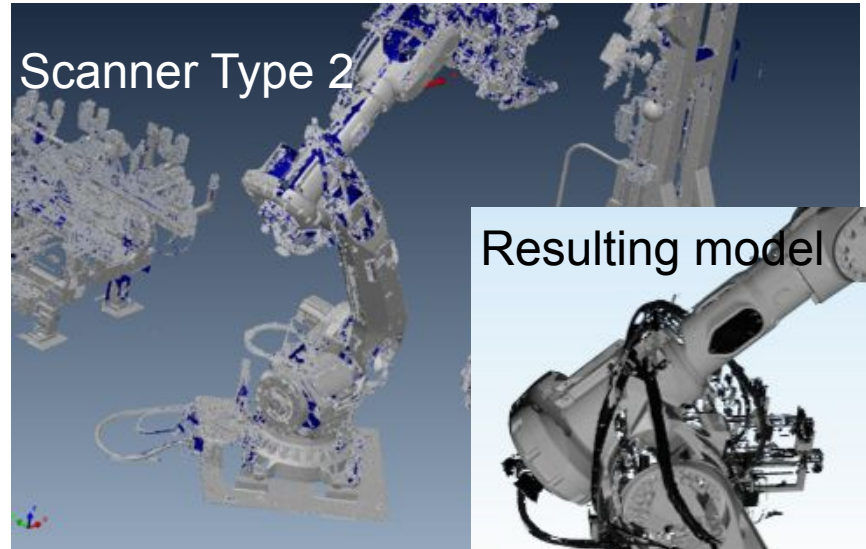
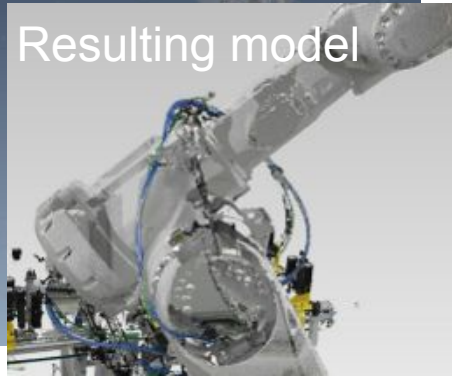
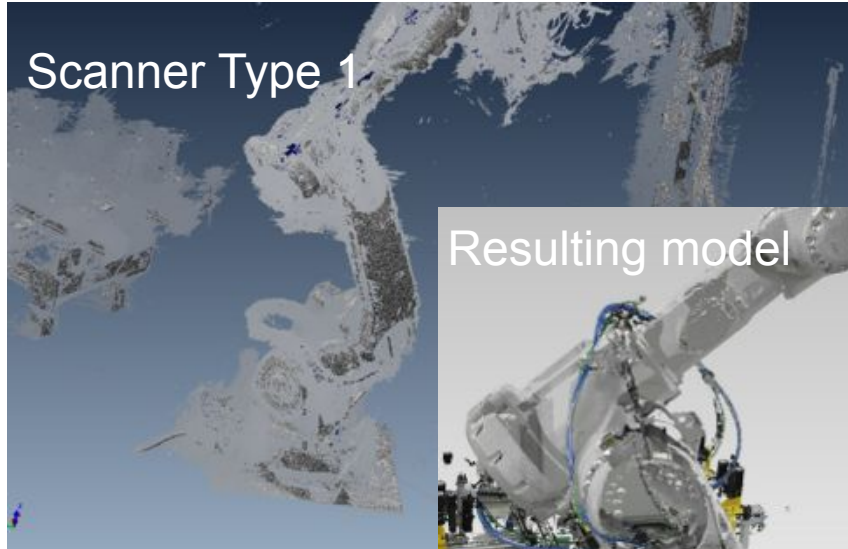
Easily identified differences

The original model is blue.

The scanned layer green



Example of cloud data from different scanner of the same items



Not all cloud data is the same quality, the crisper the details the more we work with the data.

Factors that will effect the data

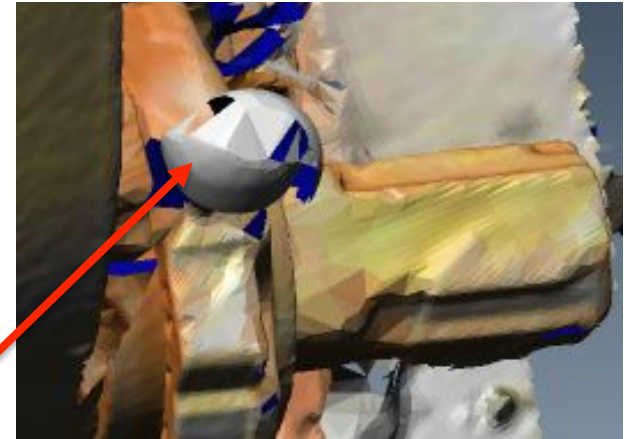
1. Scanner Ranging Accuracy
2. Scanner Angular Accuracy
(on horizontal and vertical axes)
3. Scan Registration Accuracy

Processes that will effect the accuracy.

1. Type of point cloud Registration
2. Data Processing Losses
3. CAD Fitting Accuracy

This should be a perfect reference sphere, the cause of the error is difficult to establish

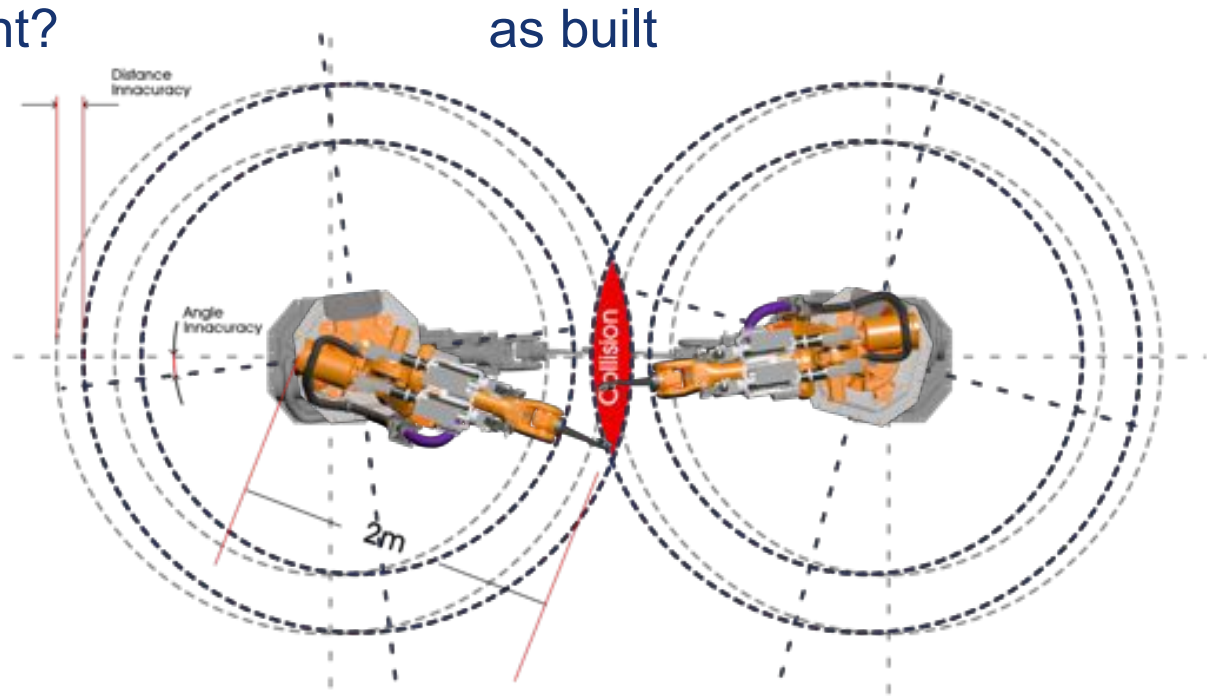
Example error after cloud data was converted to a 3D Model



Why is accuracy so important?

If not modelled to the correct accuracy:

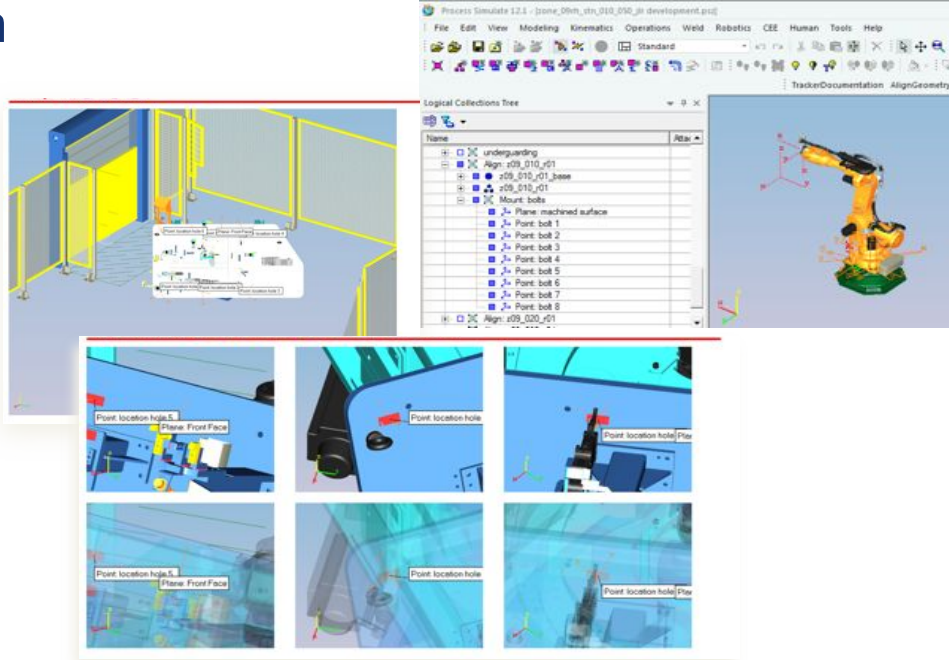
Robots that missed in emulation could collide in reality.



Example, for a 2m long robot arm on a 400mm radius measured base, the error at the tool could be up to 5 x the measurement error

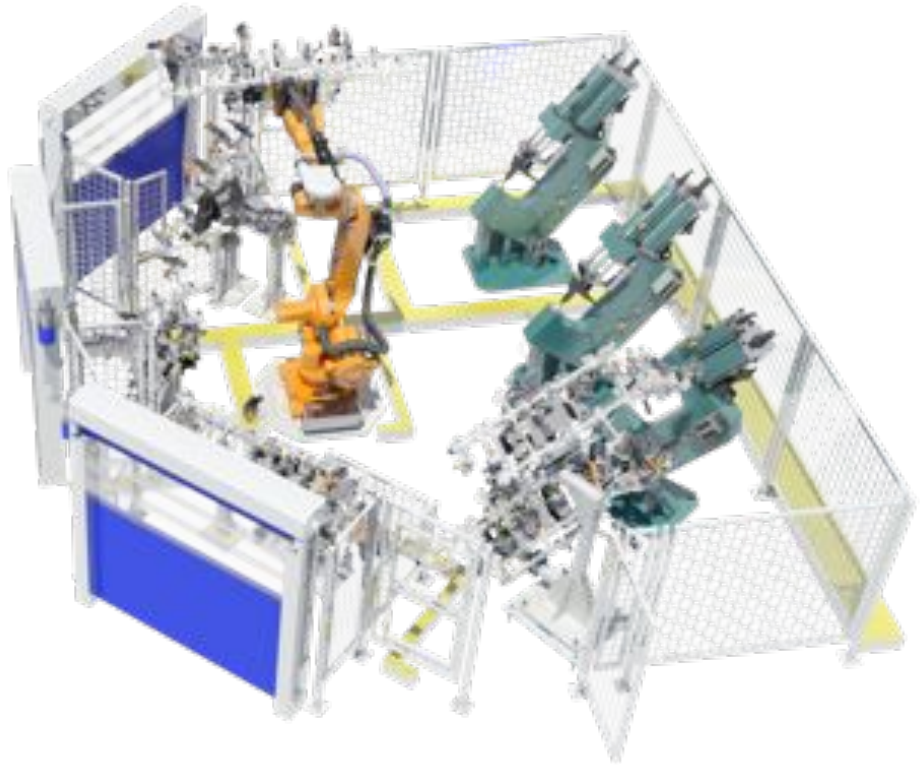
Create a measurement plan directly within Process Simulate

- A standard operator can select which equipment (robots, fixtures, remote tools etc.) needs to be measured
- Automatically produces the laser tracker's measurement program.
- And exports the measurement documentation.





Enabling the team to work free of site restrictions in a virtual environment of **the actual facility as built.**



Accurate model combined with the actual PLC control, enables us to emulate the facility with unprecedented levels of confidence.

- Prove the **actual** build capacity early (cycle time)
- Improved visibility of key mile stone
- Fully understand the production process early
- Understand the impact of new product introductions
- Evaluate robot working envelope without damage (Robots, Tooling or Fixtures)
- Validate safety concepts early (interactive safety zones)

The question is no longer “what can we do?” It’s

“what do we want to do?”



OEM



Tier 1
Primary LB



Tier 2
Eng Houses

Accurate Emulation Equals

- ✓ **Earlier start** of production
- ✓ **Lower cost** of change
- ✓ **Product** focus
- ✓ **Less Waste**

- ✓ **Major Risk reduction:**
 - ✓ Factual decision making
 - ✓ Mature processes
 - ✓ Right the first time

- ✓ **Standardisation** of processes and components
- ✓ **Collaborative** and **Efficient** Engineering
- ✓ **Validation** reduces risks on site

