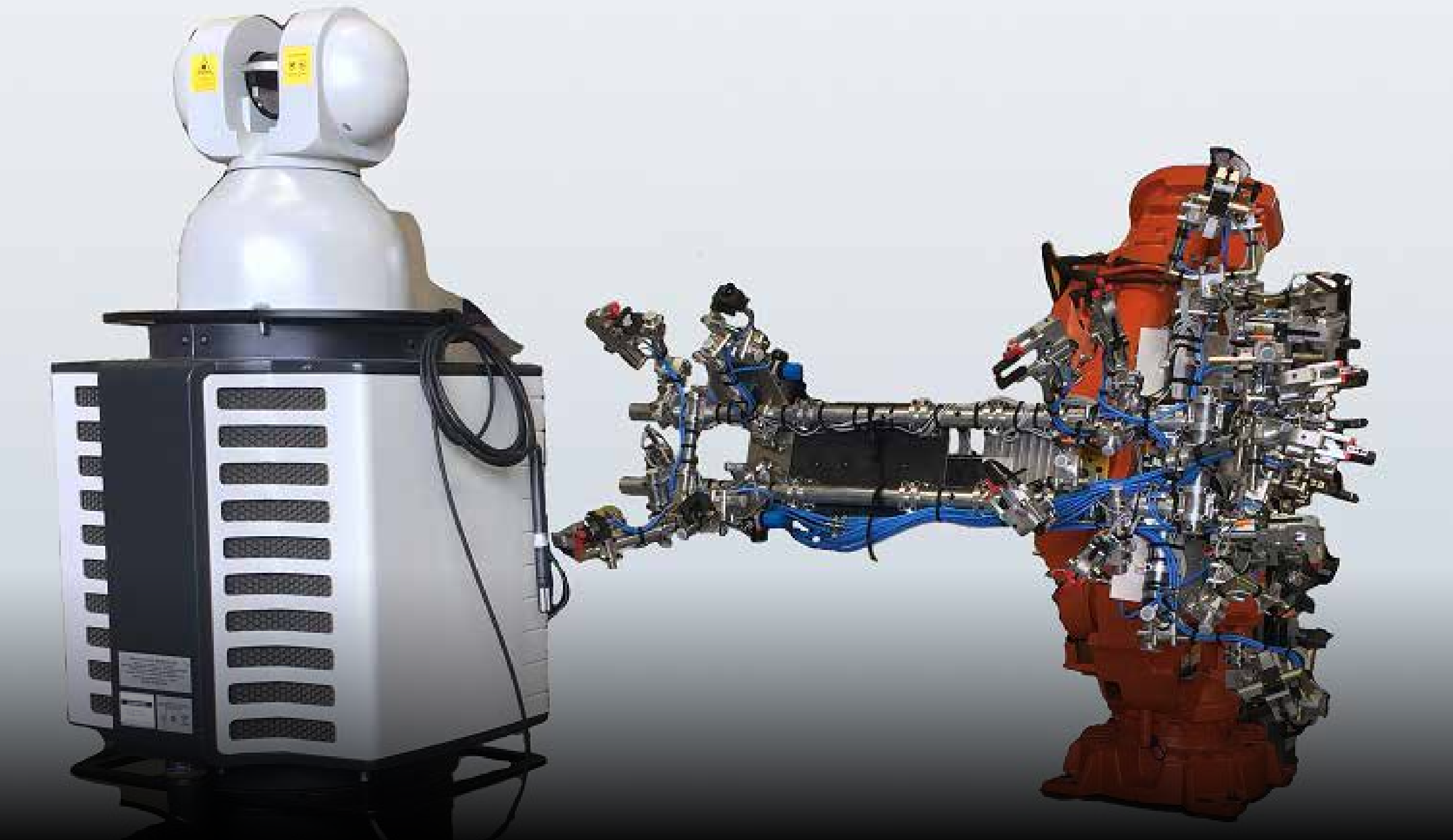
Creating complex "spare" tooling using MV330 laser radar

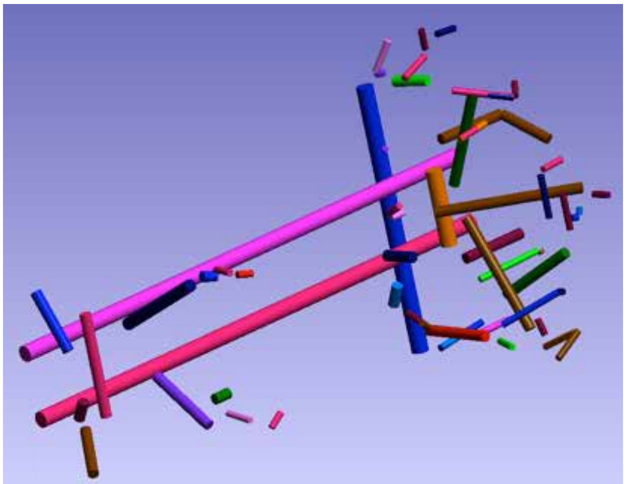


New gripper verification at Nikon Metrology Tamworth.

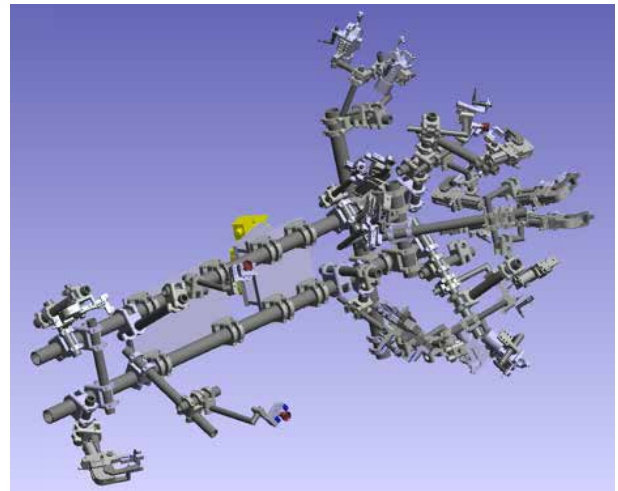
VDL Steelweld BV is one of Europe's premier suppliers of integrated robotic production lines. It called on Nikon Metrology UK to help produce a spare robot gripper on one of its newest systems. In order to manufacture this spare gripper, the installed gripper needed to be measured and the original gripper design needed to be updated based on the measurement data. The key challenges to measure the installed gripper were complexity (the gripper works between multiple fixtures) and access (the robot is right in the middle of a very congested robot garden). The solution was the MV330 Laser Radar.

The first step was to measure the production gripper on-site. There was no access around the robot to measure with a manual inspection system, and the gripper was so large/complex it needed to be measured from a number of different positions. The solution was to use a Laser Radar outside the automation cell in a fixed position, using its large volume, high precision capability. The robot lifted the gripper high above all of the other robots in the robot garden. A simple alignment system with tooling balls temporarily affixed to the gripper was created. The robot was then moved through a series of positions with all parts of the gripper inspected – all to the common alignment system. Note this is a handling gripper without any datum pins/holes.

After the gripper was measured, the results were taken into CATIA V5R19 at the version request of the end customer. Nikon Metrology UK then updated the original design to the true "as built" condition to enable the spare to be made.



Reverse engineering the robot gripper geometry.



Updated CATIA model

After manufacture, the new spare gripper was delivered to Nikon Metrology UK in Tamworth, and inspected prior to delivery on to customer site. As per the real production line, the gripper was mounted onto an industrial robot, and moved through a series of positions to replicate the same process used in the production line.

The analysis is based on the positions of the measured cylinders vs nominal cylinders at a given reference plane on each nominal cylinder. This was the main manufacturing task on the gripper to confirm clash-free conditions in the production fixtures. Clamps were also inspected.

The project showcased many strengths of the Laser Radar technology. Firstly the large range stand-off, where the instrument was many meters away from gripper, and needed nobody, or no equipment, inside the robot garden for measurement success. This inspection generated information to "act". In this project that was to update the 3D CAD CATIA V5R19 assembly model. This gave a revised baseline to build the new gripper and inspect it. The inspection itself was very fast using an automated script, and no manual intervention.

TECHNICAL SPECIFICATIONS LASER RADAR MV330

Single point 3D measurement uncertainty (2µ)*

Range		Azimuth Angle	Elevation Angle	Range	3D Uncertainty	
m	ft	6.8µm/m	6.8µm/m	10µm + 2.5 µm/m	µm	Inches
2	6.6	13.6	13.6	15	24	0.0010
5	16.4	34.0	34.0	22.5	53	0.0021
10	32.8	68.0	68.0	35.0	102	0.0040
15	49.2	102.0	102.0	47.5	152	0.0060
20	65.6	136.0	136.0	60.0	201	0.0079
30	98.4	204	204	85	301	0.0118

* Tooling ball target grade 25 or less
* Laser Radar must be calibrated and operate in a stable environment