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Metal Scanner

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Metal Scanner

Heavy Machinery

Lidar

For a European OEM in the Railway industry, we built a measurement system out of laser profilers and a CNC gantry that measures sub-millimeter deformation of large (~5m length) metal parts near real-time, to improve productivity in high-value manufacturing steps, and reduce the number of iterations required to achieve dimensional accuracy.

- Improved precision in large-scale metal part manufacturing by **detecting deformations early**
- By integrating accurate scanning with real-time visualization, the solution helped **reduce unnecessary rework** and enhanced decision-making on the factory floor



Approach

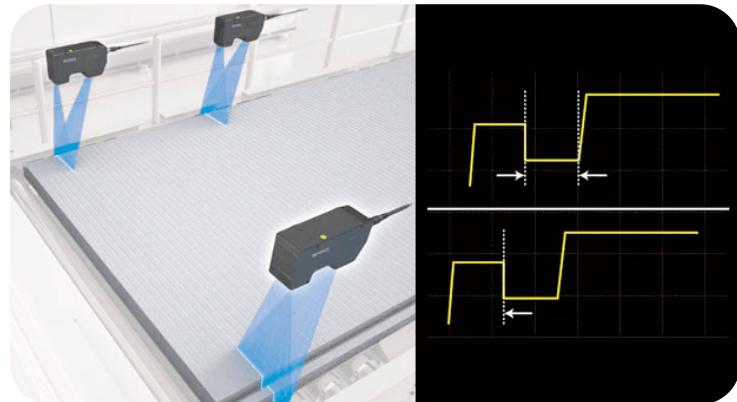
1. First we developed a measurement system combining two key components:
 - **High-precision sensor** capable of detecting deformations on **flat, reflective metal surfaces** down to **~0.1 mm** accuracy
 - A **gantry system** to **move the sensor precisely** across large parts
2. The scan results were **compared to CAD models** and displayed in a **bed leveling view** for quick visual analysis
3. **Workers could immediately spot deformations** and begin the straightening process on-site
4. Welders in the previous step **receive faster feedback** on the dimensional accuracy of their parts, and can adapt their approach

Existing solutions to dimensional accuracy usually involve 3D cameras or Time-of-Flight sensors. One typical solution is to scan a part with an iPad, which combines a Lidar and several cameras to map the surface of a part. But the accuracy is nowhere near the necessary sub-millimeter precision across 5m or more, which is often necessary on large metal structures. Stereo cameras and ToF sensors are also prone to errors caused by the high reflectivity of flat, unpainted metal parts.

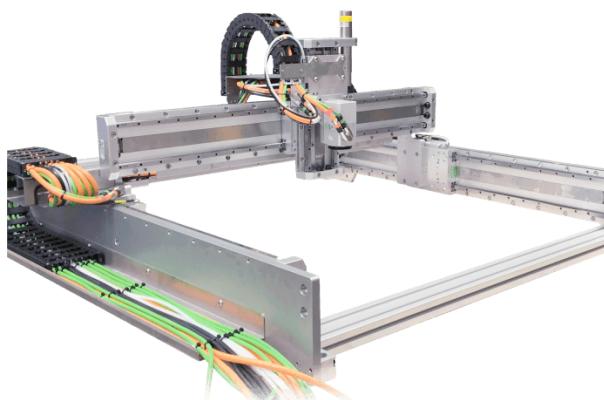
By comparison, our approach is more precise and more tailored to the product that is being manufactured.

Technologies

- Keyence Laser Profilers
- CAD models and [VisionLib](#) for comparison
- Rapid Prototyping Gantry System with precise stepper motors and aluminium extrusions for flexibility



Laser profiler measuring positional accuracy of a flat part



Off-the-Shelf 2D CNC Gantry, typically used for CNC machines