Description of Process: Brackets were spot-welded to bars.

Before Improvement:

The brackets were sometimes attached to the bars backwards. If these pieces were not detected, they would be assembled, leading to defects that had to be reworked later.
Process: Tightening nuts

Problem: Insufficient torque caused by drops in pneumatic pressure

Prevent Error: X
Detect Error: X
Shutdown: X
Control:
Alarm:

Key Improvement: Operation tied to value of critical physical quantity

Description of Process: Nuts are tightened with a specified torque with a power wrench driven by pneumatic pressure supplied throughout the factory.

Before Improvement:

If air pressure dropped during tightening, no warning of the problem was given, and the conveyor continued to move. Therefore, bolts were tightened with insufficient torque.

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Process: Bending

Prevent Error: X

Shutdowm:

Detect Error:

Control:

Alarm:

Key Improvement: Jig modified to guarantee correct positioning

Description of Process: A plate with holes at diagonal corners is bent by a press.

Before Improvement:

The worker checked the orientation of the workpiece before setting it in the jig. However, the workpieces were sometimes processed upside down. The defects were discovered only at assembly, causing delays in delivery.

![Diagram of correct and defective workpieces]
Process: Drilling
Problem: Workpieces set up backwards

Prevent Error: X
Detect Error: 

Key Improvement: Jig modified to guarantee correct positioning

Description of Process: The workpiece is set into the jig and drilled. The workpiece has two cutouts on the underside.

Before Improvement:

Even when the workers in charge were attentive, it frequently happened that the workpieces were set in position and drilled backwards, resulting in defects because the holes were in the wrong position.

Diagram:
- Correct:
  - Correct hole positions

- Defective:
  - Wrong hole position