



14 Mistake Proofing Examples: Improve Quality at Virtually No Cost

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Benefits of Poka Yoke

“Poka Yoke” is a Japanese term that means **prevention of inadvertent error**.

If many manual operations are performed in your manufacturing facility, mistakes are probably made daily, resulting in extra costs (sorting, re-processing, scrapped material...) and delays.

In this case, **setting up poka yokes are among the lowest-cost measures you can take to prevent those mistakes** and reduce costs. It is a step toward elimination of end-of-line inspection.

Benefits of Poka Yoke

We seldom see good poka yoke systems in Chinese factories. The reason is simple: few process engineers in this country have seen good examples that they can reproduce. They are often quite capable of handling the implementation – what is missing is the inspiration.

This is why **we have compiled this list of examples that involve different approaches.** We hope it helps inspire your engineers, technicians, production supervisors & leaders, and operators.

What Exactly Is a **Poka Yoke**?

Different people have different definitions of poka yoke. According to Michel Baudin, here are three characteristics of the best poka yokes:

- **Poka-Yoke are devices to prevent mistakes.** It's all about people. A feature in an automatic machine that detects and responds to malfunctions, while useful, is not a Poka-Yoke. In a manual operation, a Poka-Yoke makes a mistake physically impossible; in a machine operation, it prevents the operator passing on parts with a defects introduced by the machine.

What Exactly Is a **Poka Yoke**?

- **A Poka-Yoke works 100% of the time.** It flows logically from what it is. A device that reduces the rate of human error by 95%, while useful, is not a Poka-Yoke. A device that fails good parts, even rarely, is not a Poka-Yoke either.
- **A Poka-Yoke does not add work for the operator.** This is essential, because devices that do add work are disconnected or bypassed under pressure.

Examples Included in this Ebook

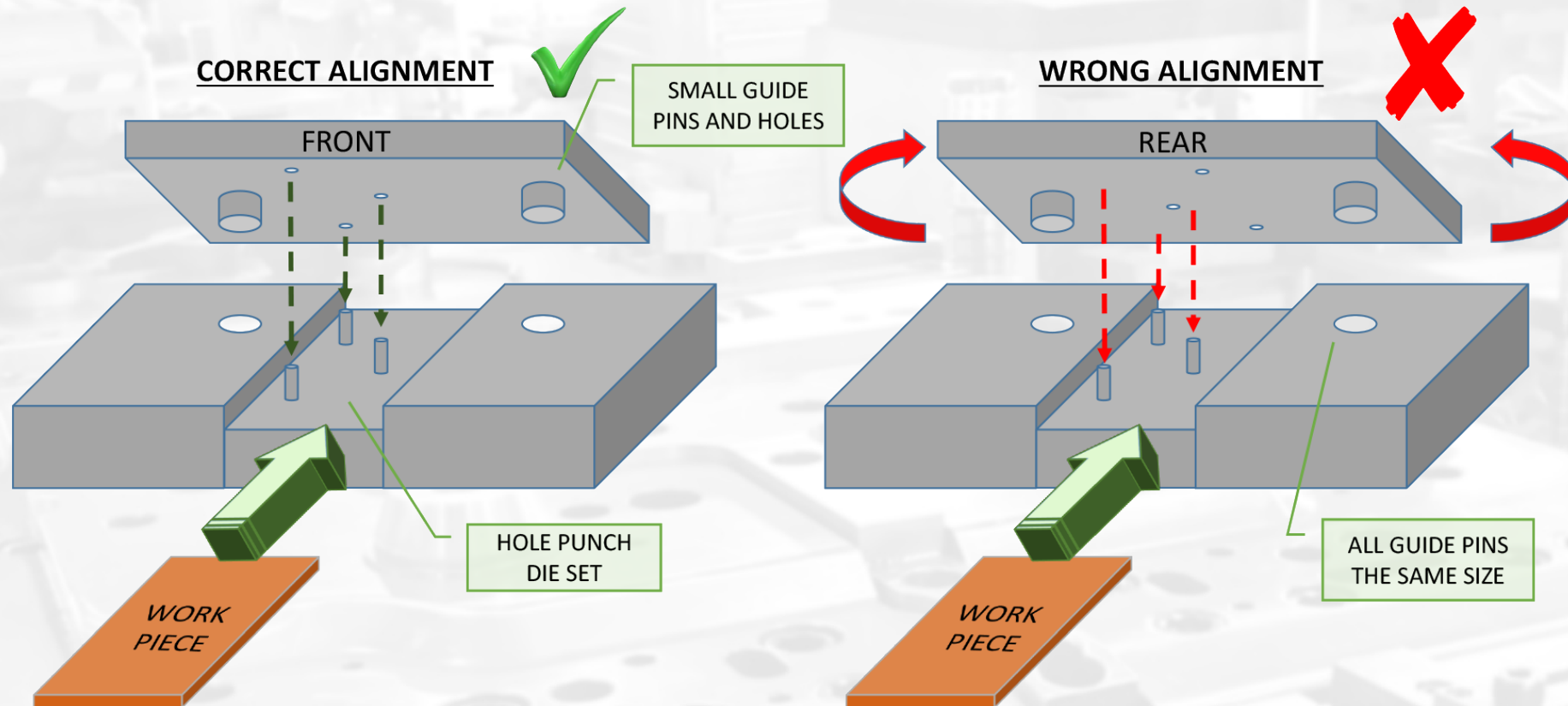
To us, anything that reduces the likelihood of a quality issue without increasing operational or appraisal costs is a poka yoke. It is usually inexpensive to put in place – it required more creativity than money.

Examples included in this e-book improve quality in different ways:

- Some **prevent human mistakes.**
- Some **prevent mistakes in automated processes.**
- Some **detect mistakes** and alert operators (this is not as good as preventing mistakes).
- Some simply **guide operators** through color codes or checklists (this is not great but sometimes it is the best that can be done).

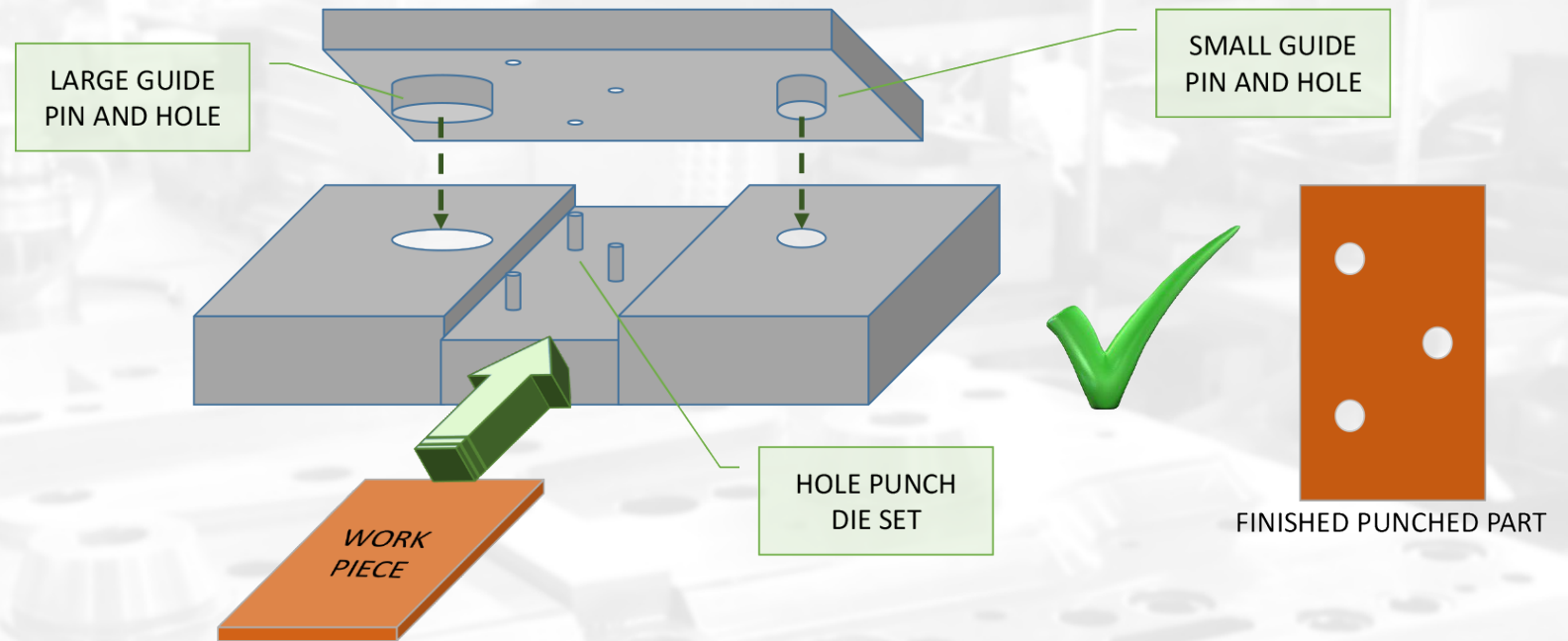
Example 1

Change in a die – the tool can only be used in one way



Easy to place the top die incorrectly (180° wrong) which results in incorrect parts being produced and in damage to the die set because the pin punches and holes do not line up.

MODIFICATION TO DIE SET, INTRODUCING POKA-YOKE (ERROR PROOFING)

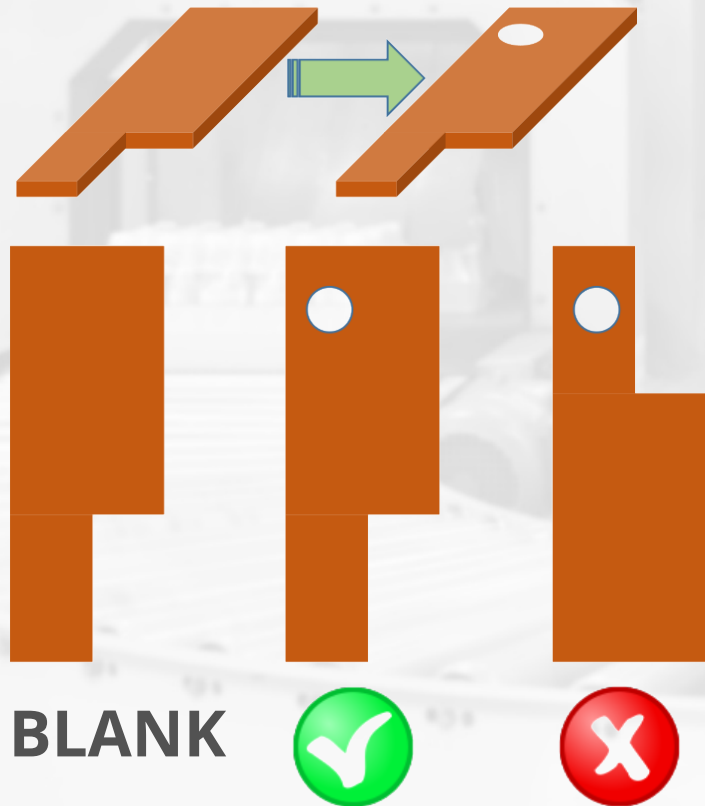


With this small modification to the die set it is impossible to fit the top die onto the bottom die incorrectly. The large diameter guide pin can not fit into the small guide hole, therefore the part will always be punched correctly and the die set will not get damaged as a result of the top die being placed the wrong way round.

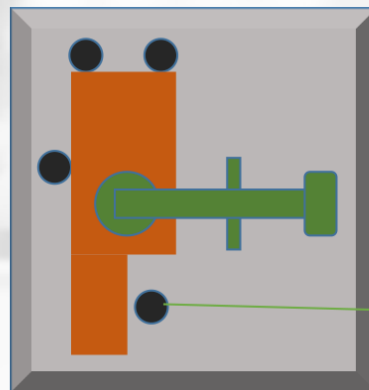
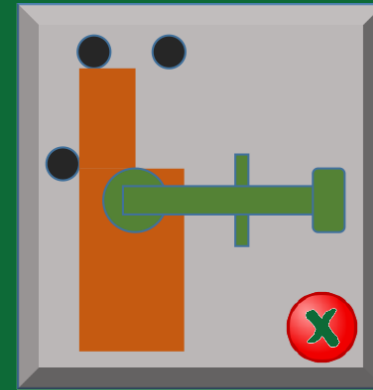
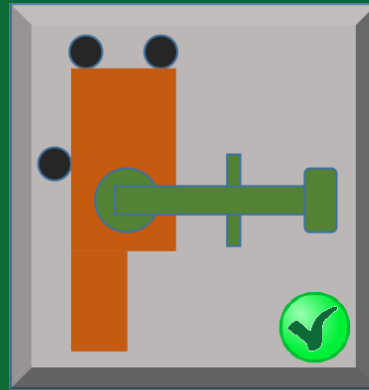
Example 2

Change in a fixture – the piece can only be placed the right way

PRODUCTION DESIGN INTENT

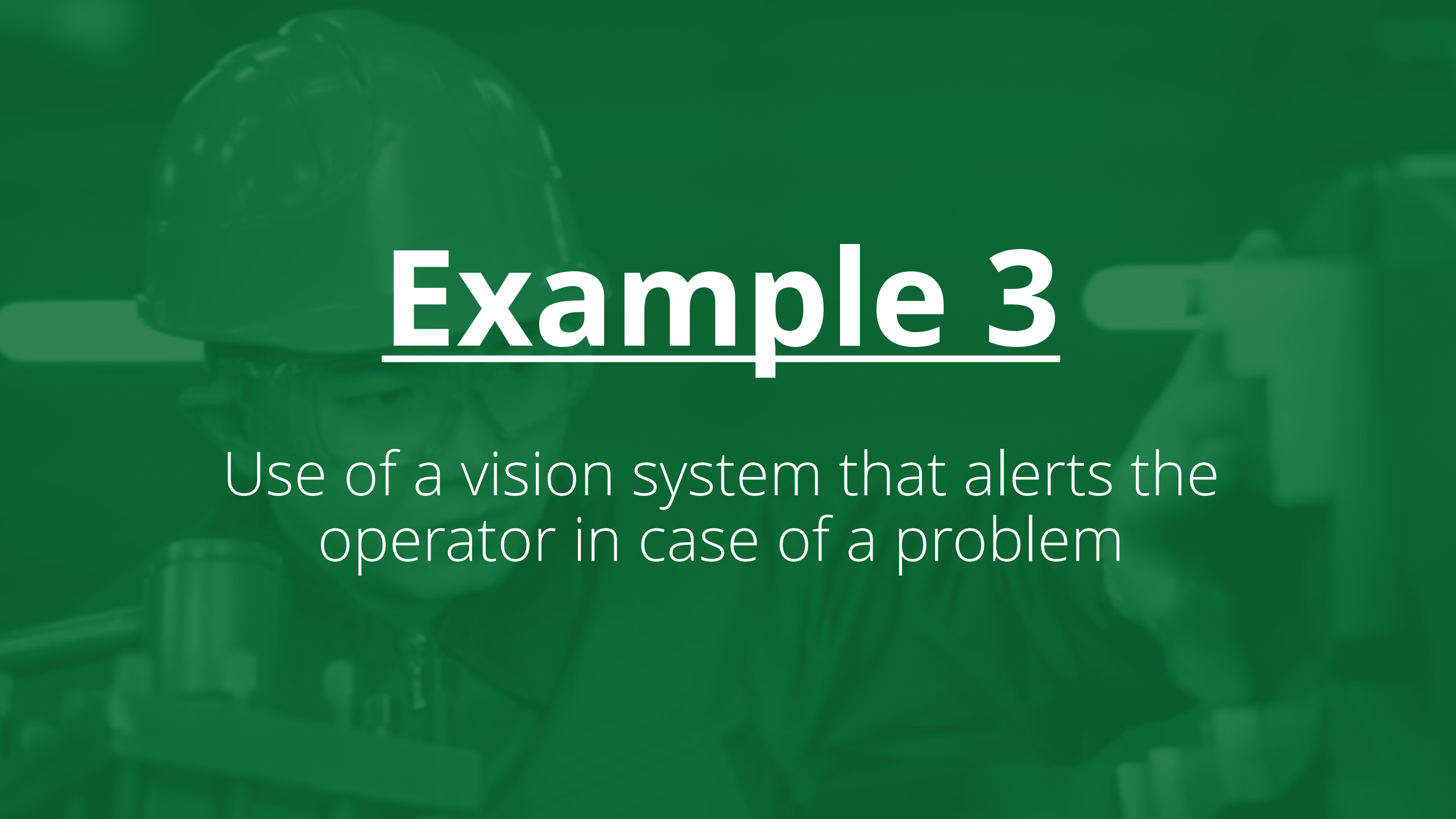


NO ERROR PROOFING ALLOWS BLANK TO BE LOADED INCORRECTLY



With a simple modification to the fixture, the blank can no longer be loaded incorrectly, therefore eliminating the risk of producing scrap parts.

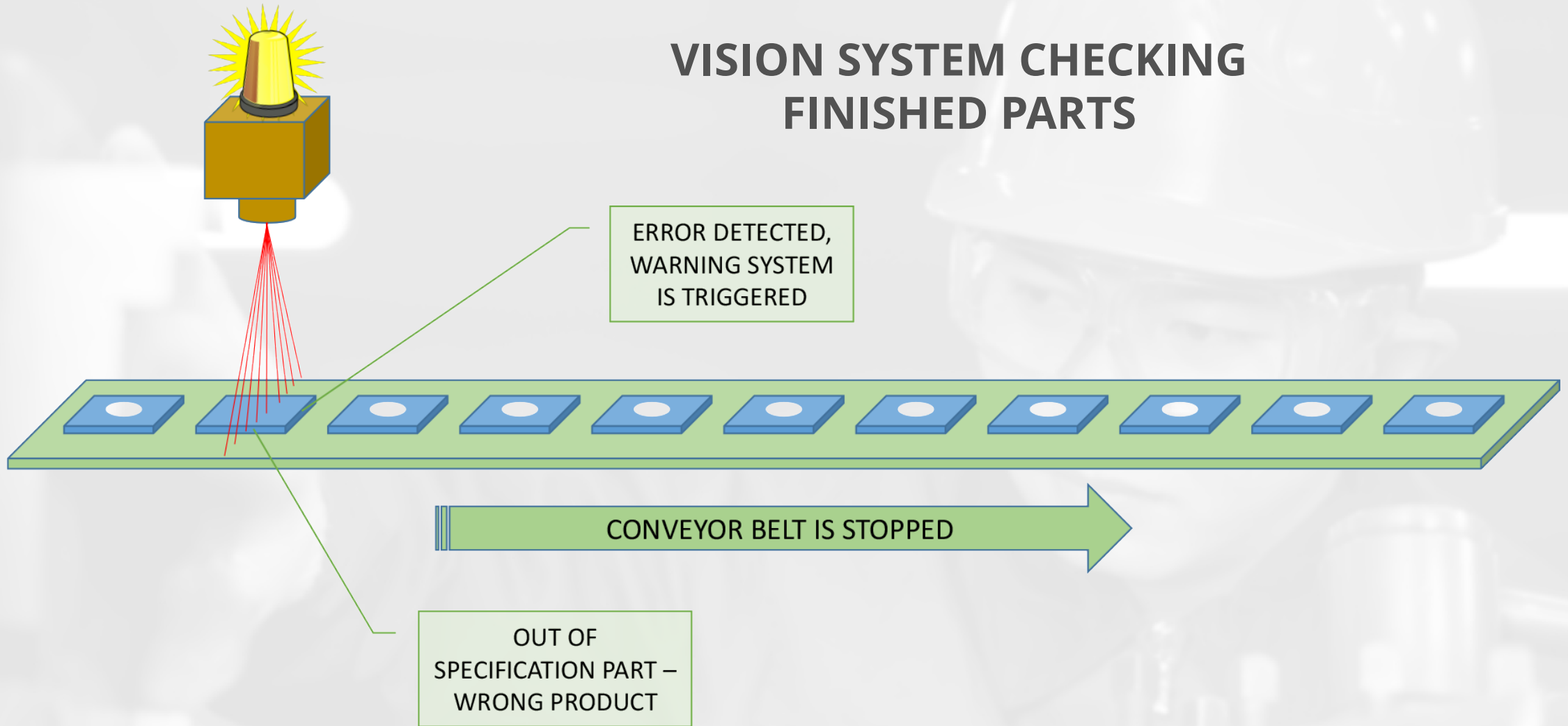
ERROR PROOF PIN
ADDED TO FIXTURE

A background image of a worker wearing a hard hat and safety glasses, looking down at a task. The image is overlaid with a green tint.

Example 3

Use of a vision system that alerts the operator in case of a problem

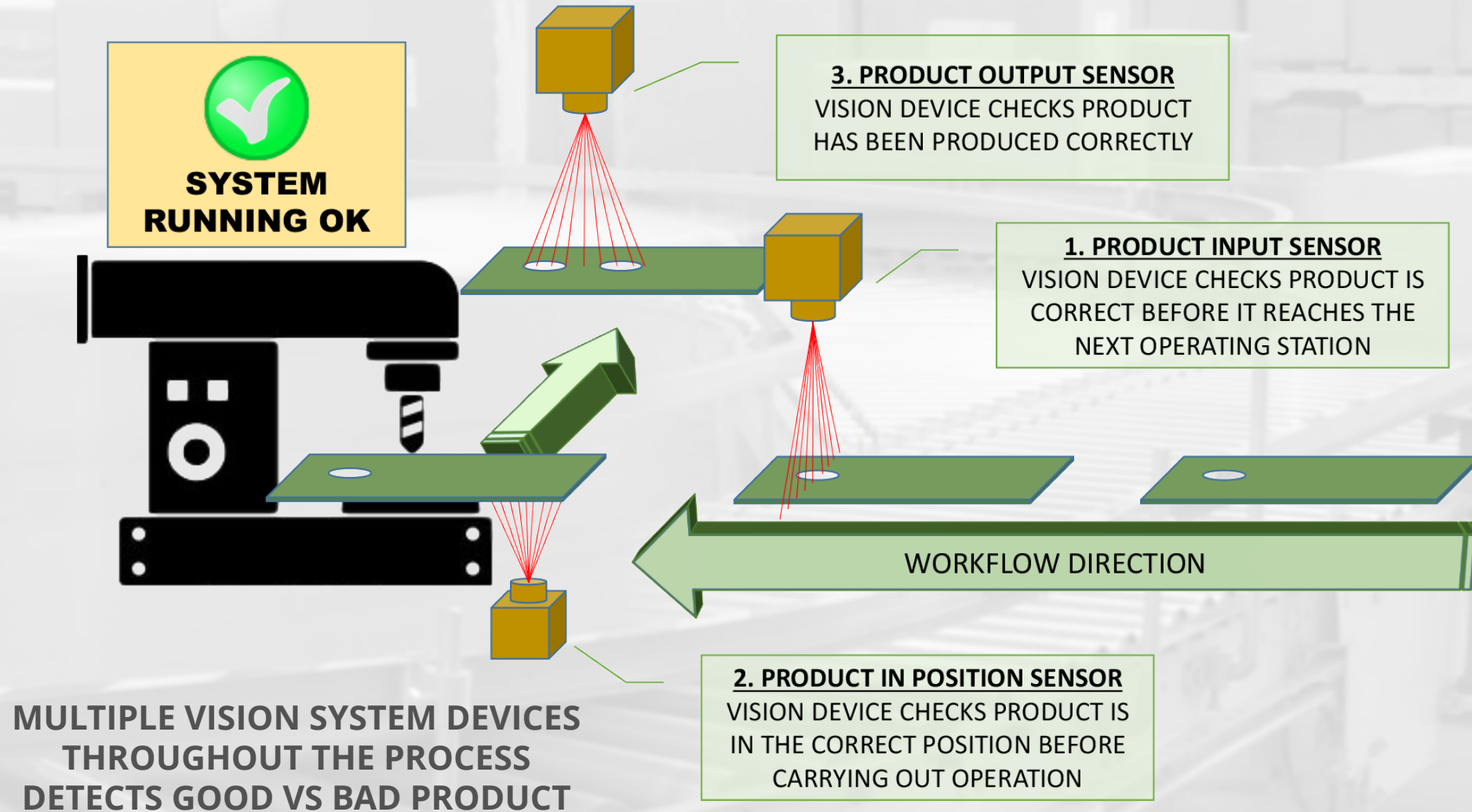
VISION SYSTEM CHECKING FINISHED PARTS



Example 4

Vision system ensures all is fine at each step of the process and work piece is present and in the correct position before process starts

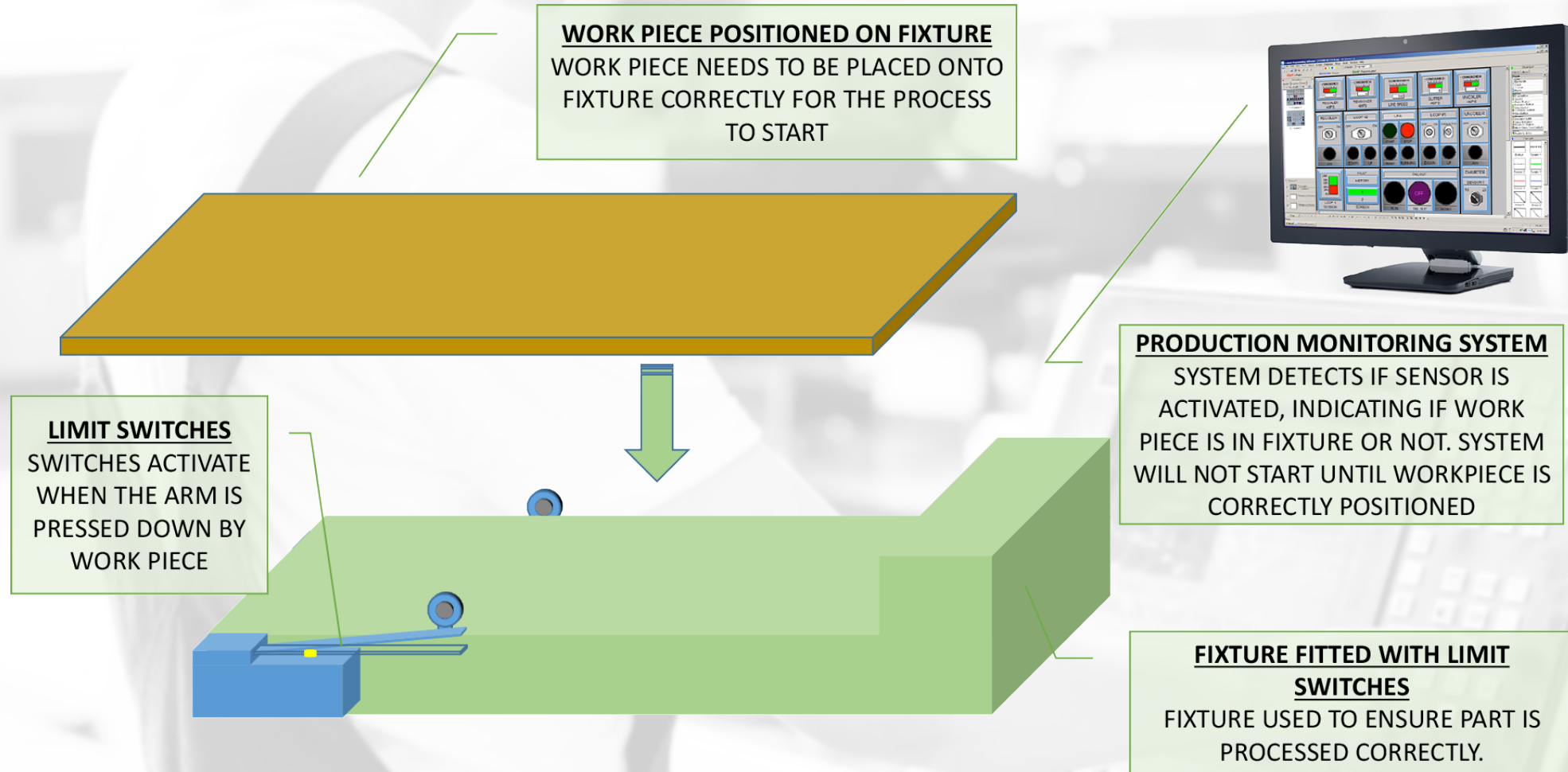
VISION SYSTEM CHECKING PARTS THROUGHOUT THE PROCESS



Example 5

Limit switch ensures work piece is present and in the correct position before process starts

LIMIT SWITCH SENSORS CHECKING PARTS ARE IN POSITION

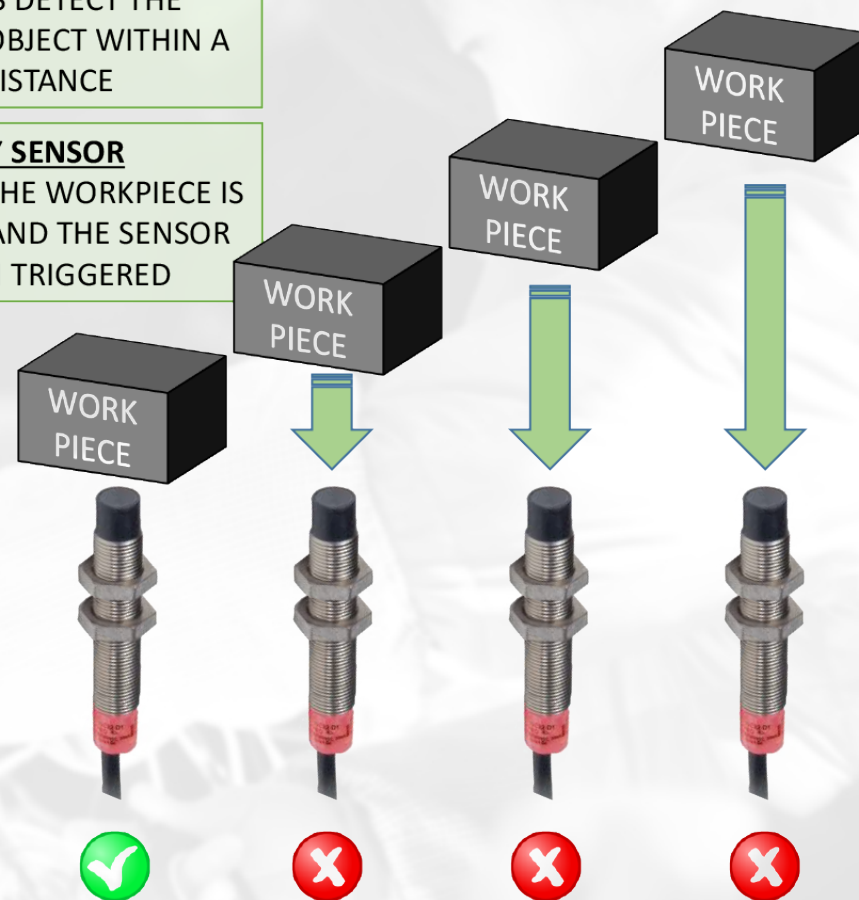


Example 6

Proximity sensors ensure work piece is present and in the correct position before process starts

THESE SENSORS DETECT THE PRESENCE OF AN OBJECT WITHIN A CERTAIN DISTANCE

IN THIS POSITION, THE WORKPIECE IS NOT IN POSITION AND THE SENSOR HAS NOT BEEN TRIGGERED

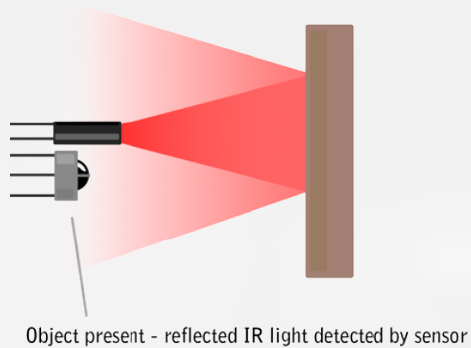
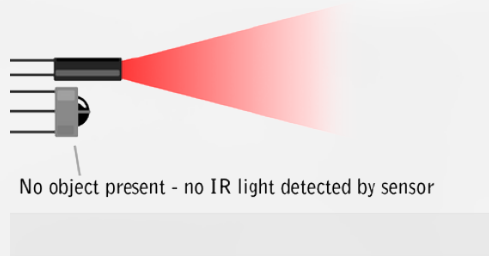


A PROXIMITY SENSOR CAN DETECT THE PRESENCE OF NEARBY OBJECTS WITHOUT ANY PHYSICAL CONTACT. THEY ARE ALSO USED TO DETERMINE THE DISTANCE BETWEEN THE WORKPIECE AND THE FIXTURE TO ENSURE IT IS IN THE CORRECT POSITION. SENSORS WOULD BE CONNECTED TO A SYSTEM THAT CONTROLLED THE PROCESS START. IF THE WORKPIECE IS MISSING OR IN THE WRONG POSITION, THE SYSTEM WILL NOT BE ABLE TO START.

Example 7

Infrared sensors ensure work piece is present and in the correct position before process starts

INFRARED SENSORS CHECKING PARTS ARE PRESENT BEFORE PROCESS STARTS

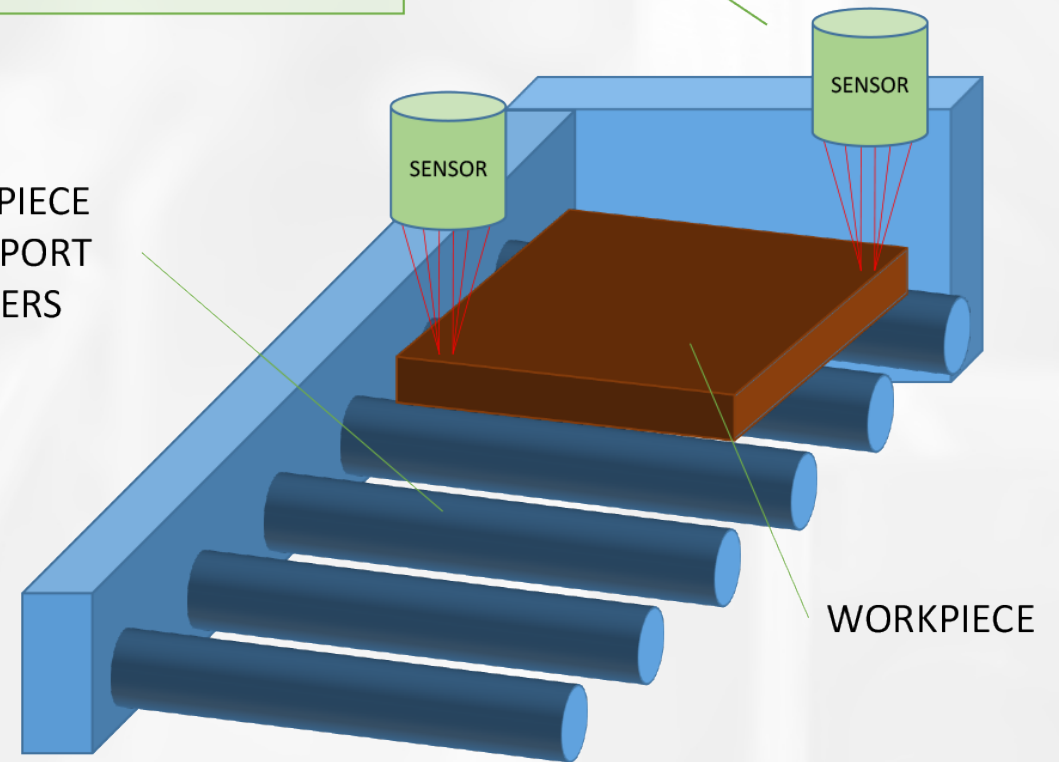


INFRARED SENSORS WORK WITH A TRANSMITTER AND RECEIVER – AN INFRARED BEAM IS FIRED FROM THE TRANSMITTER, IF THAT BEAM IS INTERRUPTED BY A SOLID OBJECT THE BEAM WILL REFLECT BACK TO THE RECEIVER WHICH TRIGGERS A SIGNAL WITHIN THE SYSTEM INDICATING THE WORKPIECE IS IN THE CORRECT POSITION.

INFRARED SENSORS

SENSOR DETECTS WORKPIECE IS PRESENT AND IN CORRECT POSITION BEFORE PROCESS STARTS

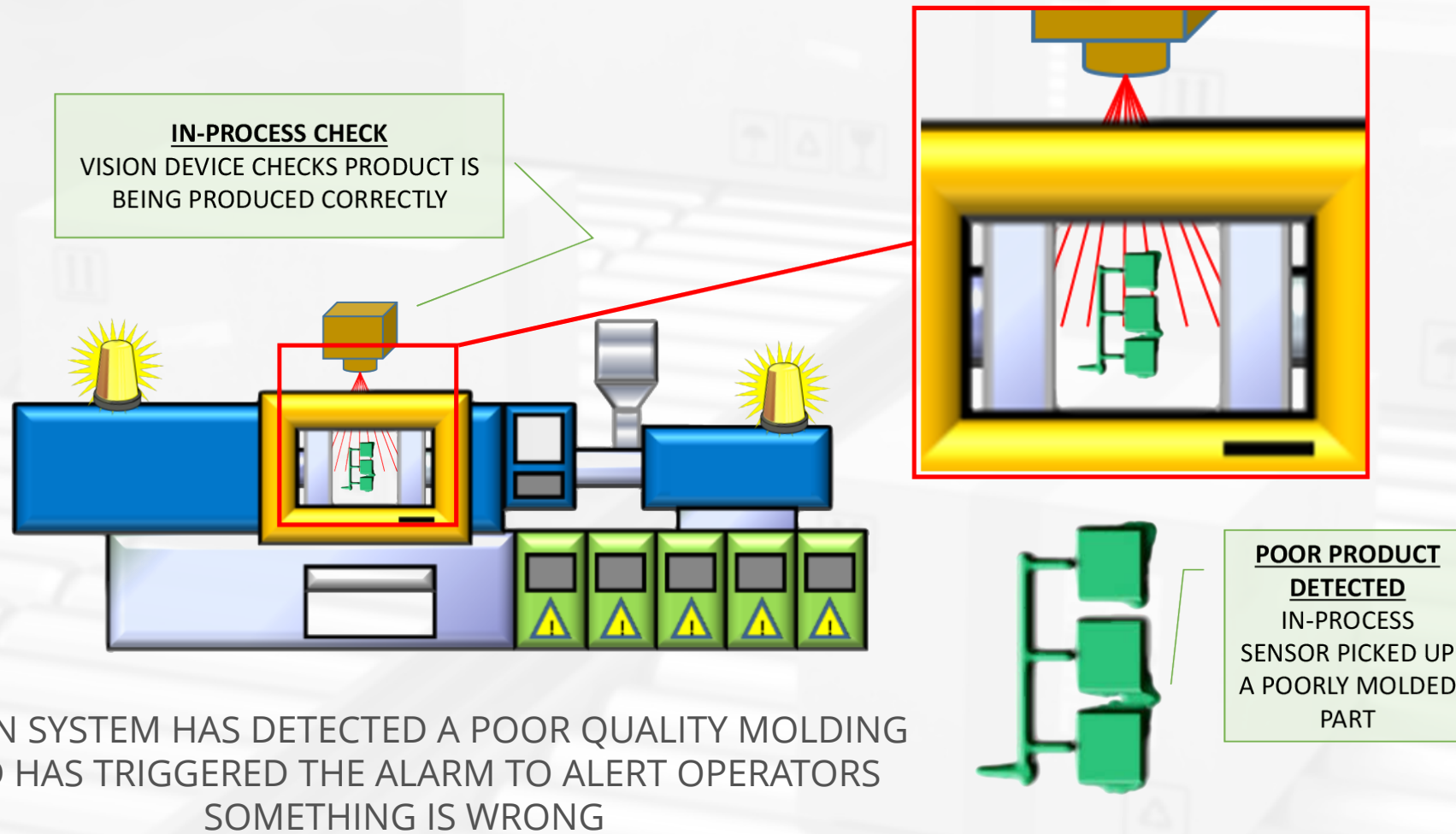
WORKPIECE
TRANSPORT
ROLLERS



Example 8

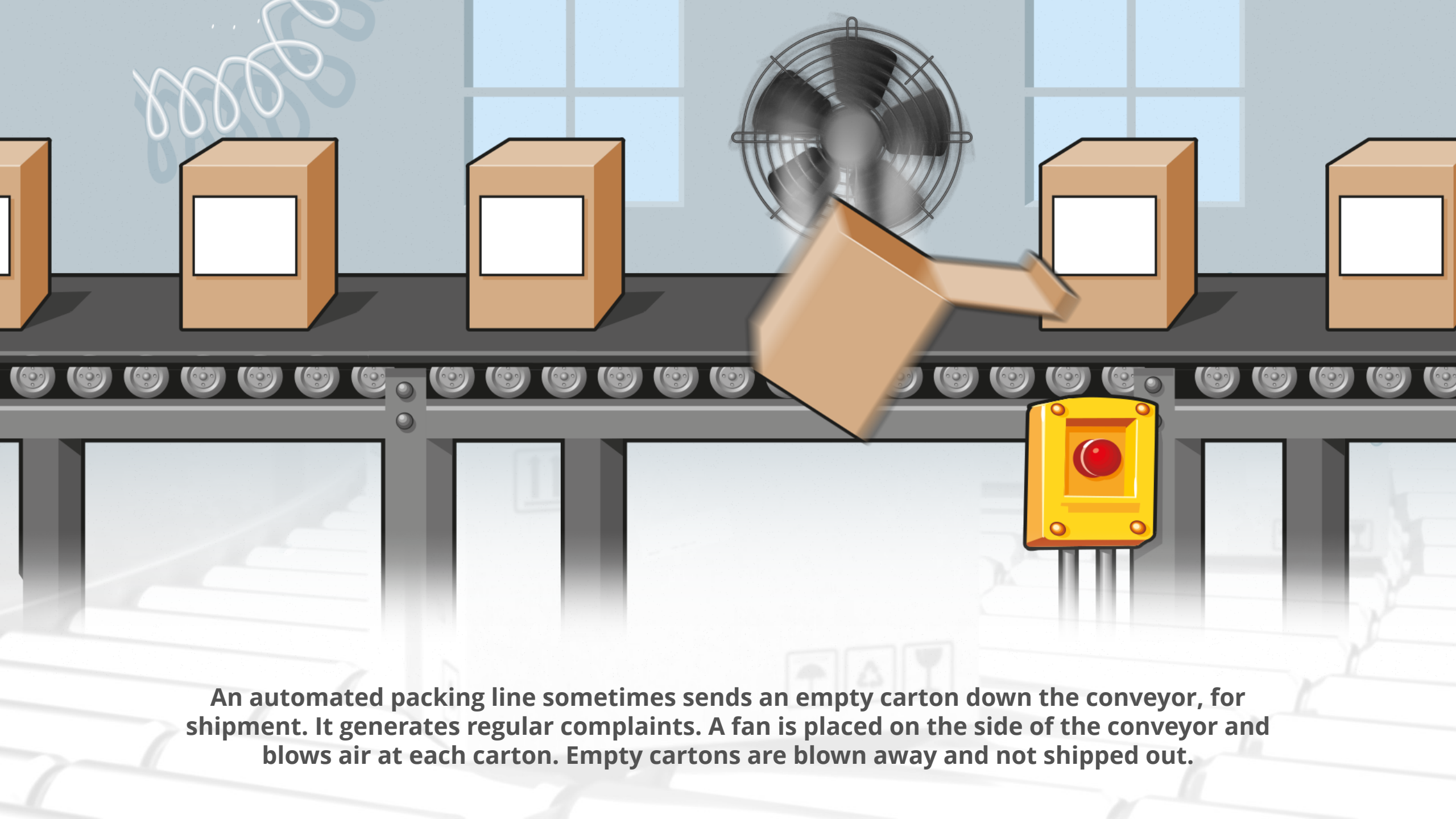
A vision system checks each piece and stops the process in case of an issue (plastic injection molding process with high degree of automation)

VISION SYSTEM CHECKING PARTS IN-PROCESS



Example 9

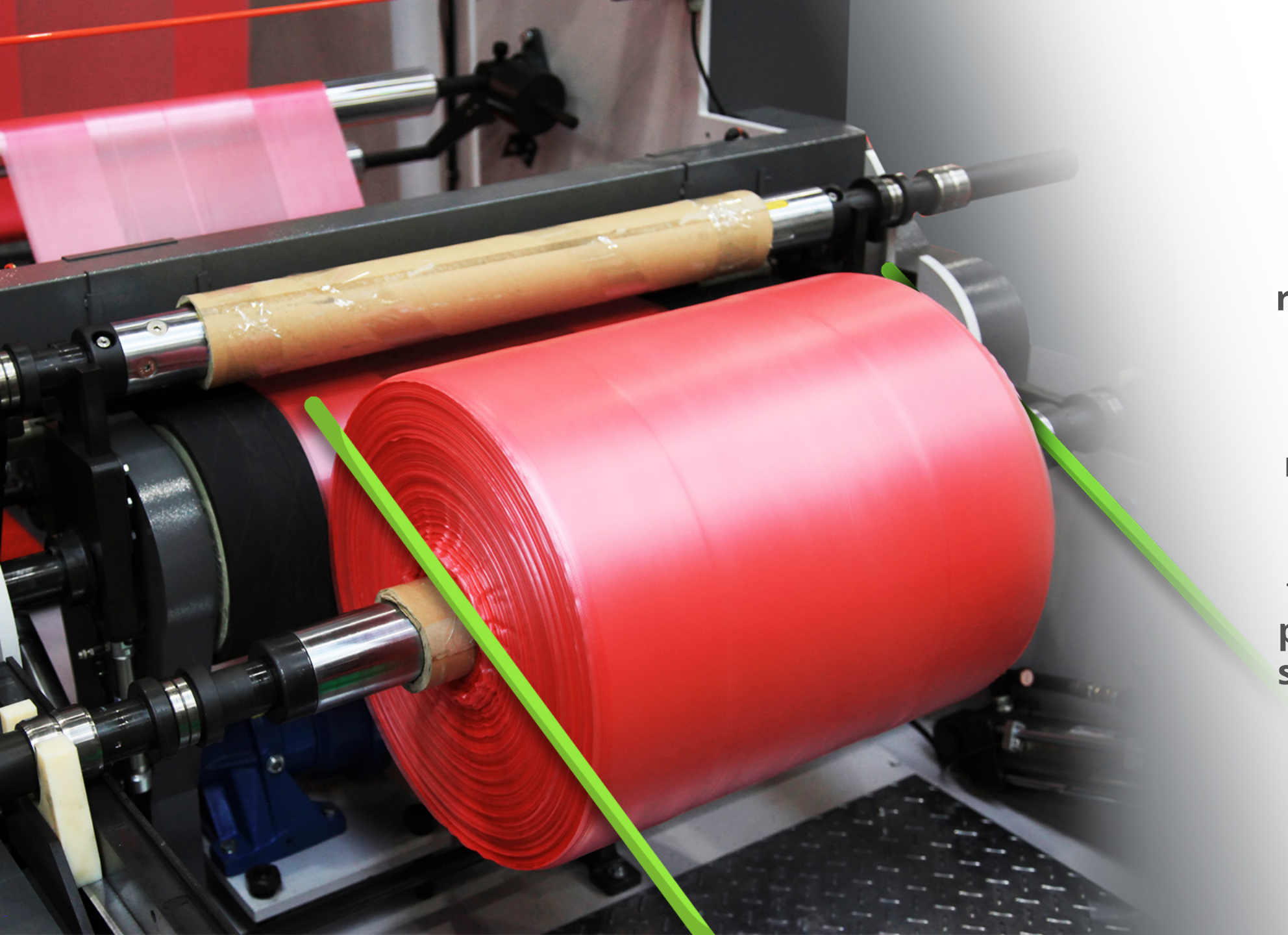
A fan blows air at cartons. Empty cartons (an infrequent occurrence) are blown off the conveyor and are not shipped out.



An automated packing line sometimes sends an empty carton down the conveyor, for shipment. It generates regular complaints. A fan is placed on the side of the conveyor and blows air at each carton. Empty cartons are blown away and not shipped out.

Example 10

Extruded plastic moves a bit left and right as it is getting rolled.
To avoid this, 2 sticks are placed to keep the roll in place.

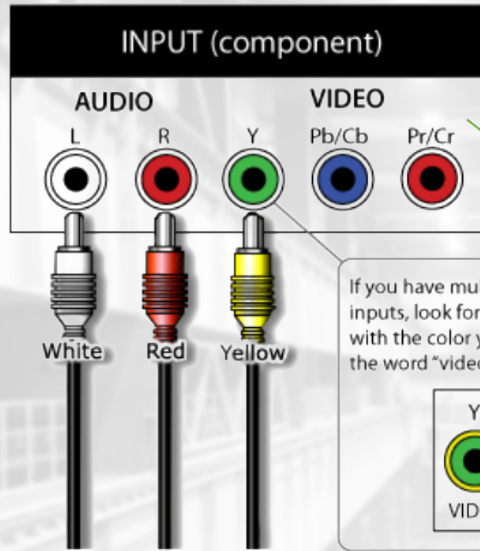


Little movements from left to right can cause defects once that roll is placed on the next machine.

To prevent that, a stick is placed on each side of the roll, to keep it in place.

Examples 11, 12, 13

A visual system that provides guidance where other approaches are not viable



If you have multiple sets of inputs, look for a "Y" marked with the color yellow and/or the word "video."



COLOR CODING SOCKETS
COLOR CODING ALLOWS
VISUAL AID FOR WORKERS AND
CONSUMERS ALIKE

COLOR CODING SPRINGS
COLOR CODING ALLOWS
WORKERS TO IDENTIFY
CORRECT SPRING QUICKLY AND
ACCURATELY



**EXTRA
LIGHT LOAD**
Yellow
Color Coded



LIGHT LOAD
Blue
Color Coded



MEDIUM LOAD
Red
Color Coded



HEAVY LOAD
Green
Color Coded



**EXTRA
HEAVY LOAD**
Brown
Color Coded

VISUAL WORKPLACE COLOR STANDARDS

	RAW MATERIALS
	AISLE
	ENGINEERING SAMPLES
	NON CONFORM PRODUCT
	REWORK
	PURCHASED PARTS
	PACKAGING

Example 14

A checklist provides operators a reference to cross check against (for processes which require manual actions)

Simple checklist can serve as a very useful tool when there are multiple manual activities involved in a process.

One example here is a generic installation & startup checklist where the operator or assembly team would complete each task and tick the appropriate box when complete.

A GENERIC INSTALLATION & STARTUP CHECKLIST

- ☐ 1. Read and understand the instruction manual.
- ☐ 2. Use a proper foundation.
- ☐ 3. Install the base on the foundation.
- ☐ 4. Install the pump and the driver (turbine/engine/motor) on the baseplate.
- ☐ 5. Add the proper oil to the proper level in the pump bearing housing(s).
- ☐ 6. Check initial alignment.
- ☐ 7. Grout the base to the foundation.
- ☐ 8. Install piping.
- ☐ 9. Complete a second alignment check, and readjust piping as needed.
- ☐ 10. Complete a rotational check of driver and, if applicable, determine the rotor electrical center (running center).
- ☐ 11. Verify correct pump settings.
- ☐ 12. Install ancillary equipment.
- ☐ 13. Install coupling.
- ☐ 14. Complete the pre-startup check procedure; fill and vent the pump and system, and check the system valve and component "lineup".
- ☐ 15. Start the unit.
- ☐ 16. Check for proper indicators such as pressures, flows, temperatures, vibrations and noise.



About the Author

Renaud Anjoran is president of **China Manufacturing Consultants** and helps factories improve quality, increase productivity, automate processes, and increase capacity. He has previously been business manager of a French importer's Hong Kong branch. After that, he founded a quality assurance agency.

*He received a **MS of Int'l Business** from **Bordeaux Business School** and an **MBA** from **Wake Forest University**. He is also a certified ISO 9001 lead auditor and an **ASQ certified quality engineer**.*

Renaud's experience is internationally recognized, having been quoted in the New Yorker and the LA Times, and his articles have also been published in Quality Progress (ASQ), Business Insider, the China Law Blog, China Chief Executive, and more.



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