File name: Mistake proofing OpEX webinar _ Invest NI.mp4

Moderator questions in Bold, Respondents in Regular text.

KEY: **Unable to decipher** = (inaudible + timecode), **Phonetic spelling** (ph) + timecode), **Missed word** = (mw + timecode), **Talking over each other** = (talking over each other + timecode).

Catherine Boyle: This webinar is about using mistake-proofing in your process with the goal of achieving zero defects. My name's Catherine Boyle, and I work for Invest Northern Ireland as an Operational Excellence Coach. The Operational Excellence Team are trained coaches with numerous years of business experience across a wide range of sectors and sizes of companies. We work with Northern Ireland businesses to improve their productivity, profitability and competitiveness. If you've any queries or you want some more information about the support that we offer, then please send your request through to opexquery@investni.com. During this session, I'll talk about how you can use mistake-proofing in your processes to help you to eliminate and control the volume of defects and rework. I'll also show you how to implement mistake-proofing systems in your business. Why is it important to strive for the goal of zero defects? It's accepted that people, machines and systems can make errors. However, some of these mistakes will result in defects which may end up as rejects with your customers or even lead to a safety incident. The cost of having poor quality performance can be up to 15% of your sales, but these costs are not always visible. There's so much more than rework and scrap levels. Poor quality will negatively impact a business in many other ways which can be even more costly.

For example, lost sales due to having a bad reputation, time spent by staff investigating quality incidents and carrying out additional quality checks, poor employee morale and high turnover etc. Using effective mistake-proofing devices and systems in your process will detect mistakes that occur before they are passed to your customers, and in some cases, prevent errors from being made in the first place, thereby reducing these costs associated with poor quality performance. Mistake-proofing is often used in everyday life, and you may not even have been aware that you were using mistake-proofing devices. Dosage control of children's medicines is achieved by using the measuring spoon which is supplied with it. Some children's medicines are also available in single-dose sachets to make things even easier. Pneumatic nails come in different colours which correspond to different nail lengths and thicknesses. There's an automatic alert that comes up on your screen to ensure that files are saved prior to closing them. Colour-coded wiring is used a lot in electrical systems to ensure that the correct wires are connected into the relevant sockets. For example, the wires in a plug are coloured such that they can still be differentiated by those who are colour-blind, i.e. the earth wire is green and yellow striped, and the brown live wire is a darker colour than the blue neutral one. In this example, the paint is visible when the bolt is fully tightened, so you can tell at a glance if any of the bolts are loose.

These coloured tags are often seen on vehicle wheel nuts to make it easier to tell if a nut has come loose. In this photo, you can see at a glance that some of the wheel nuts have loosened, as the tags are no longer

aligned in a circle. In this case, the bolt head shears at a predetermined torque level, ensuring that the bolt is seated correctly but not overtightened. There are two different approaches to mistake-proofing, or poka yoke, which are problem prevention and problem detection. The one you choose may depend on a number of factors including the process itself, technology cost and availability, the impact and cost of defects, customer requirements etc. The control approach avoids generation of defects in the first place. With this approach, once a problem is detected, the process stops automatically so corrective action can be taken immediately. In other words, using the control approach is mistake prevention, where process inputs are controlled. If a warning approach to mistake-proofing is used, when a problem is detected, the occurrence of a deviation is signalled using warning devices like buzzers, lights and alarms. However, the process will continue to generate defects until corrective action has been taken by the employee. In other words, using the warning approach is mistake detection, where process outputs are controlled. There are three different methods which can be used for mistake-proofing, and these can be employed for either mistake prevention or mistake detection.

Contact mistake-proofing can be used to detect any deviation in physical characteristics, like size or position. Fixed-value mistake-proofing is most appropriate when there is a repeated activity, for example, using a timer or counter. A motion-step method is used when there are a number of activities that have to take place in a specified sequence. I'll talk about each one now in a bit more detail and give some examples of them. The first method is contact type mistake-proofing. This can be used to detect any deviations in shape, dimensions, position or other physical characteristics through mechanisms that have direct product contact. Contact methods can be used in situations of rapid repetition or infrequent production, and they're suitable for use in cases where the environment is challenging, such as poor lighting, dust, noise, critical temperature etc. Here are some common examples of contact type mistake-proofing. The insulation on the live and neutral pins of a plug to prevent electrocution. Using a hand drill with a depth gauge to stop you from drilling too deep. Jigs and templates are used to ensure dimensional accuracy. Guide pins are fitted to tooling to ensure correct location. And at the airport, airlines use a simple luggage gauge to check that cabin bags will fit in the overhead lockers. Next you'll see a short video which shows an example of how a local business in Northern Ireland designed a simple contact type mistake-proofing system. The company make conservatories, and as part of their process, they have to apply a seal to a beading which goes along all four edges of every single window frame. The very manual process was extremely time-consuming and gave inconsistent quality results, leading to lots of rework, which further delayed each job.

Speaker 2: Here's a great wee improvement we came up with in the glazing department. So, this here, we just put on behalf (ph 06.44) before, so you would have to stick it all (ph 06.49), lined up, and went up it bit by bit trying to keep the same margin, up the edge of the glazing, bead. As you can see, it's very hard to get a consistency on it, a very time-consuming process. Maybe in a job, you know, you would maybe have 60, 70 metres of this to do, and this is only maybe about, like, 400-500mm long. So, again, it's very rough, very inconsistent. Very time-consuming. So, that's what-, that's the way we used to do it. So, we had to do that for every single piece of glazing on the job.

Catherine Boyle: Next, you'll see how they applied mistake-proofing to this task to make it easier. In

addition to improving their quality performance with perfectly-aligned seal every time, the simple contact type mistake-proofing device reduced their cycle time on this task from around four hours per job to being complete in just fifteen to twenty minutes.

Speaker 2: Okay, so this is the new improvement they came up with, so there'll be the jig here for this purpose, for it to fit in. Site your tape onto the edge, position it. Feed it through. So, as you can see, took the job down to seconds. So, it took us an average, maybe, four hours to do the entire job, and we're down to about fifteen, twenty-minute job. That's the power of a two-second (ph 08.26) improvement.

Catherine Boyle: The second type of mistake-proofing is fixed value. The fixed value method is used in operations where the same activity is repeated several times. This method employs automatic counters, timers, or optical devices and controls the number of moves, the rate and length of movement, as well as other critical operating parameters, for example time or the number of units. So, here are some common examples of fixed value type mistake-proofing. A bag filling machine with weight control to make sure all bags contain the same amount of product. Tablet counters are used in pharmacies to ensure the correct quantity is dispensed without having to manually count out tablets one at a time. Traffic lights change after a period of time to optimise traffic flow. There's a countdown timer on a microwave to prevent overcooking. Space separation with barriers is used in airports and theme parks to prevent queue jumping. And turnstiles in train stations and concert venues are used to regulate the flow of human traffic. The direction of flow can be reversed at certain times of the day or at the end of the concert. The third type of mistake-proofing is motion step. A motion step method is useful for processes requiring several different activities to be performed in a specific sequence. This type can be used for both manual and automatic processes. For example, you can use sensors to determine if a process step has occurred before the next one starts.

If the step has not occurred, or has occurred out of sequence, the sensor signals the operator or stops the machine. Here are some examples of motion step type mistake-proofing. When there is a pre-programmed automated sequence, for example, in a manufacturing plant, non-conformances or deviations are detected using sensors. These are flagged with an alarm or an alert so that the operator's aware of the sequence error and can take action if necessary. Motion step mistake-proofing can also be used in manual sequences, like in this example which shows part of engine assembly line. The workstation has been designed so that it's easy for components to be assembled in the correct sequence. So, how do you actually go about implementing mistake-proofing in your process? Start by choosing a pilot area and process to start working on. List all potential mistakes and errors that could occur. This can be done using a formal approach like FMEA or HAZOP, or it can be based on previous experience of internal defects and customer rejects. Prioritise these in terms of severity and likelihood of occurrence, and work on the most significant ones first to identify their root causes. Then brainstorm with the team from the area to come up with some ideas for how these errors and mistakes could be prevented. Ideally, you want to be able to detect the mistakes early before more are generated. Run a trail with the new mistake-proofing system and monitor its performance. This may take a few tries before you develop an optimal solution.

So, just to recap on what we've covered in this session. Mistake-proofing can be used to reduce or even eliminate the possibility of passing on errors or defects to the customer. Ideally, mistake-proofing should be considered during process development, but it can still be added into existing processes as part of continuous improvement activity. The two main approaches are control or error prevention systems, and warning or error detection systems. If you want more information on anything that has been discussed during this session, please send your request through to opexquery@investni.com, and thank you for listening.

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