# Optimizing Sheet Margin Protection from Contaminants

innovative sensors for canmaking

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# I. INTRODUCTION

Margin contamination is one of the leading reasons for unplanned downtime. A contaminated margin can:

- cause a weld wire break with associated downtime

- damage the weld roll so that it will have to be reground

- damage the weld roll so often or so badly that it needs to be replaced

- cause a bad weld/ leaky can

### HOW MANY SENSORS ARE NEEDED?

A typical metal sheet that goes through a slitter has six (6) weld margins. Sheets for larger cans may have a smaller number of margins. Does this mean a sensor is needed for each margin?

Innosen conducted a series of tests in a can factory during a production run to determine how the number of sensors installed in the slitter affected the number of margin errors detected. Results showed that a single sensor detects about 80% of the total number of margin errors that are detected with a sensor on each margin. Hence, this paper aims to explain how a single sensor manages to detect such a high percentage of all errors.

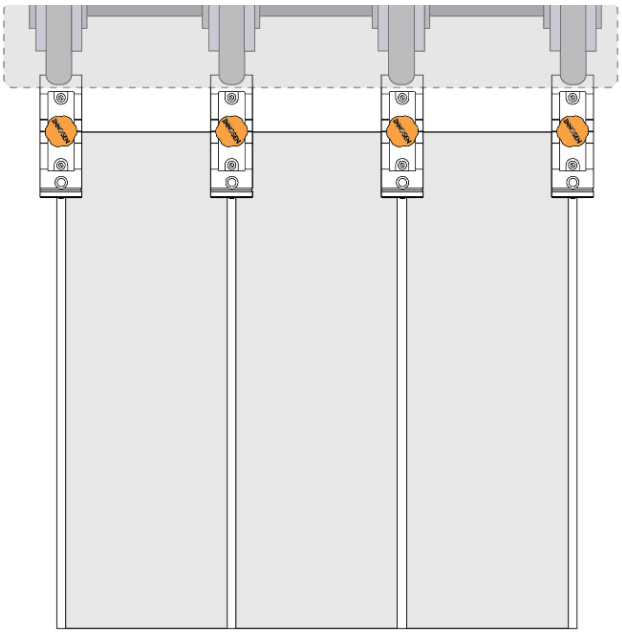

*Figure 1: IS610 Plain Margin Inspector in 4 sheet margins*

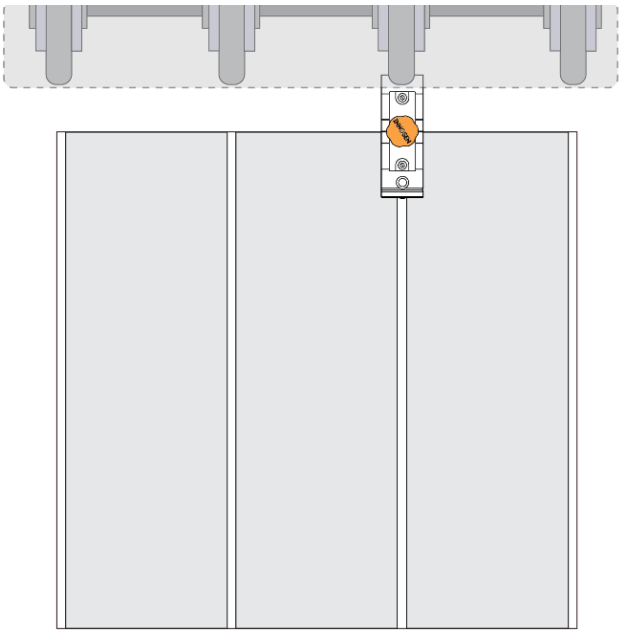

*Figure 2: IS610 Plain Margin Inspector in 1 sheet margin*

### WHERE DO MARGIN ERRORS ORIGINATE

To better understand why a single sensor can detect almost 80% of all errors, we need to better understand where the errors come from. Errors either result from sheet positioning errors or contamination. Let us look at the contamination first:

## II. CONTAMINATION FOUND ON MARGINS

The most common type of contamination detected by the sensor is the presence of lacquer splashes on the metal sheets. This defect is usually caused by two reasons:

The first reason is the viscosity of the lacquer. To achieve the desired lacquer layer thickness, the wet layer thickness is controlled to achieve certain lacquer solids content. Solids content is mostly determined by measuring the lacquer viscosity.

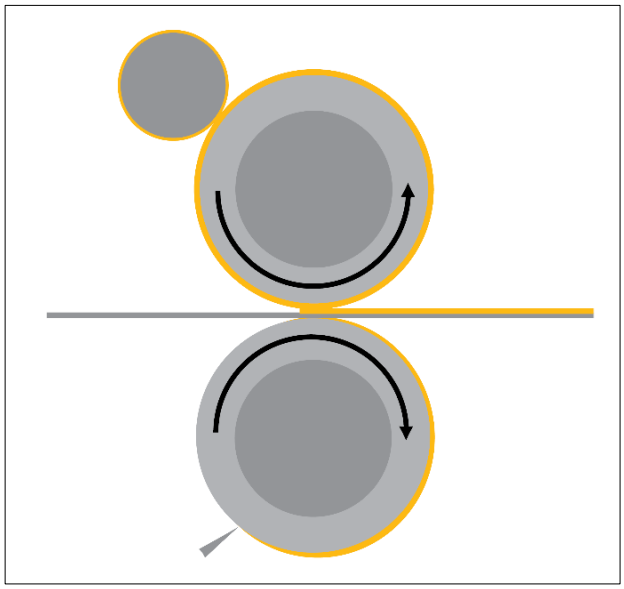

*Figure 4: Lacquer with good viscosity on the roller*

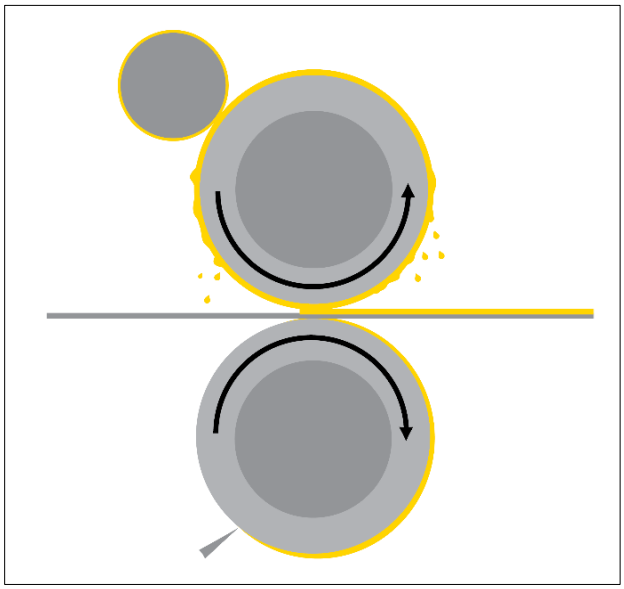

*Figure 5: Lacquer with low viscosity on the roller*

However, the viscosity is very much temperature-dependent. If the viscosity is adjusted while the temperature is too low and the temperature subsequently rises when the press has been running for a while, the viscosity could become too low.

A certain degree of thickness is required for the lacquer to stick to the lacquering roll during coating. In addition, if the lacquer is too thin, it will not stick to the lacquering roll very well. This will cause little drops to fly off and easily detach from the roller like water.

These little drops of lacquer can land randomly on any part of the sheet. This means that just one sensor is needed to know that this kind of problem is occurring. This is true because when it occurs, it is a random process so by looking at one margin you are likely to pick up that something is wrong. If, on the other hand, you want to detect every splash in every margin, sensors will need to be installed on all margins.

The other reason for having lacquer in the margin has something to do with the grooves of the coater. Grooves get dirty over time because of the hydraulic pressure pushing lacquer into the margins during the lacquering process. When a sheet goes through the lacquering rolls, excess lacquer is somehow pushed into the grooves. The accumulated lacquer in the grooves eventually works like a solid roll surface and starts lacquering the margin.

*Figure 6: Coater with clean grooves*

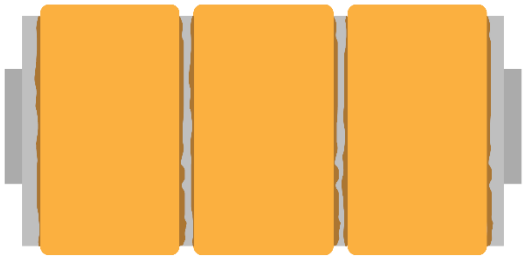

*Figure 7: Coater with accumulated lacquer in the grooves*

Little bubbles then appear and the lacquer starts spreading. It initially goes into the groove but eventually spreads more into the metal sheets as it dries. As a result, there are no more clear-cut margins. This phenomenon of lacquer build-up on the groove is often referred to as ***feathering***.

Feathering can occur so badly that it reaches the middle of the margin. The sensor then detects this kind of irregularity. Due to the lacquer build-up, it may still spread and splash everywhere making the issue obvious to the operator, which must be addressed by cleaning the grooves.

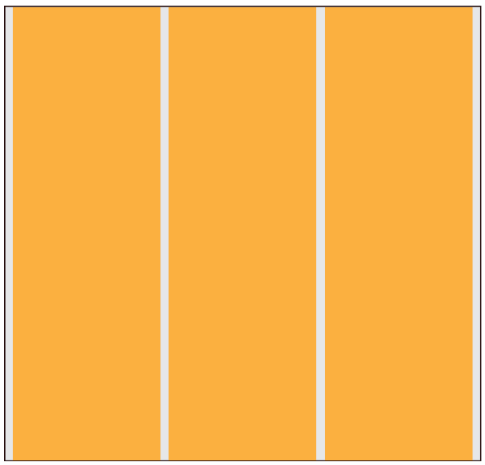

*Figure 8: Clean margins*

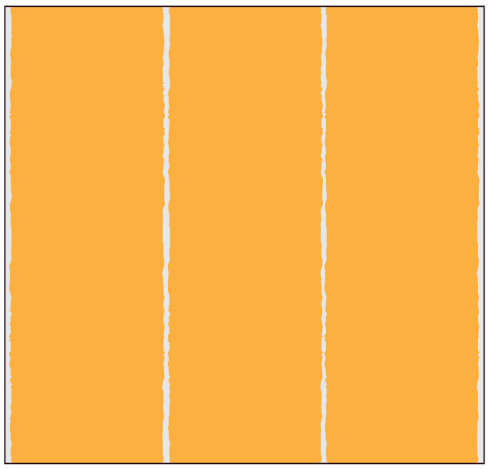

*Figure 9: Feathered margins*

# III. SHEET POSITIONING FAILURES

**So where do sheets go wrong?**

Sheets go wrong as they enter either the coater or the slitter.

If a sheet tilts or rotates upon entering the machine, it is called a skewed sheet. When a sheet moves sideways without rotating, then it is called a translated sheet

When a sheet skews or translates, every single margin on that sheet will be skewed or translated as well. In this case, only one sensor is needed to find out that there is a problem with skewing. Installing more sensors is unnecessary to detect this kind of defect.

**Sheets can go wrong in two places:**

1) In the lacquering or coating machine or 2) when it is not positioned correctly as it goes into the slitter.

There are two possible kinds of sheet movements when entering the coater. First is when the sheet moves sideways causing it to miss the side lays. When this happens, one margin on the edge will be much narrower than it should be. Since the slitter can only cut in a fixed position, it will cut through the part of the metal sheet where it assumes the margins should be. But since the sheet had moved/ shifted sideways on the coater, the position of the margins is incorrect. The resulting blanks will most likely cause problems for the welder

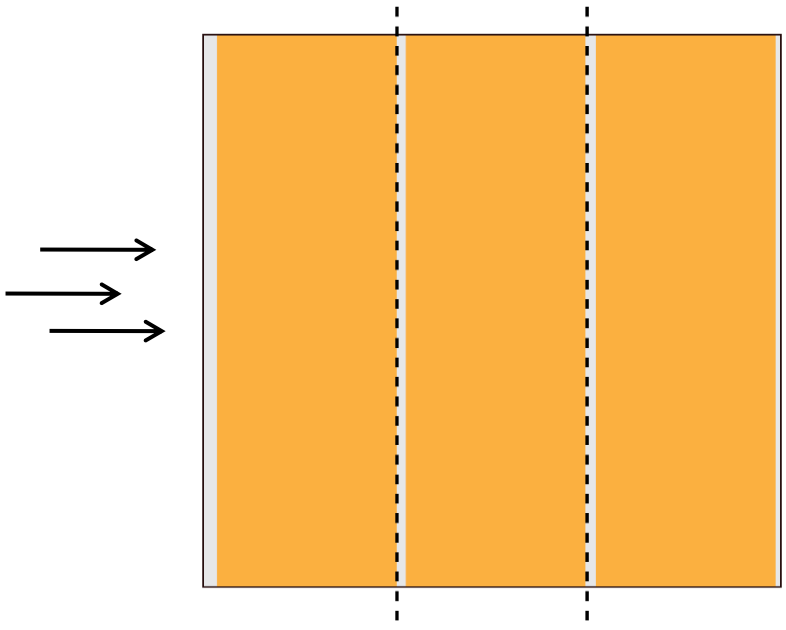

*Figure 10: Sheet that moved sideways / translated sheet*

Sheets can also go wrong in the lacquering machine when they rotate or skew. When sheets run through the coater at an angle different from perpendicular to the coating roll every margin becomes skewed. Skewed margins will be detected by the margin inspector as the metal sheet passes underneath it. When the detector sees lacquer instead of metal, it then gives a signal to the operator that something is wrong. To prevent this at the source and avoid pallets of faulty sheets, it is highly recommended to install a skew detector. See IS416 Sheet Skew Measurement System.

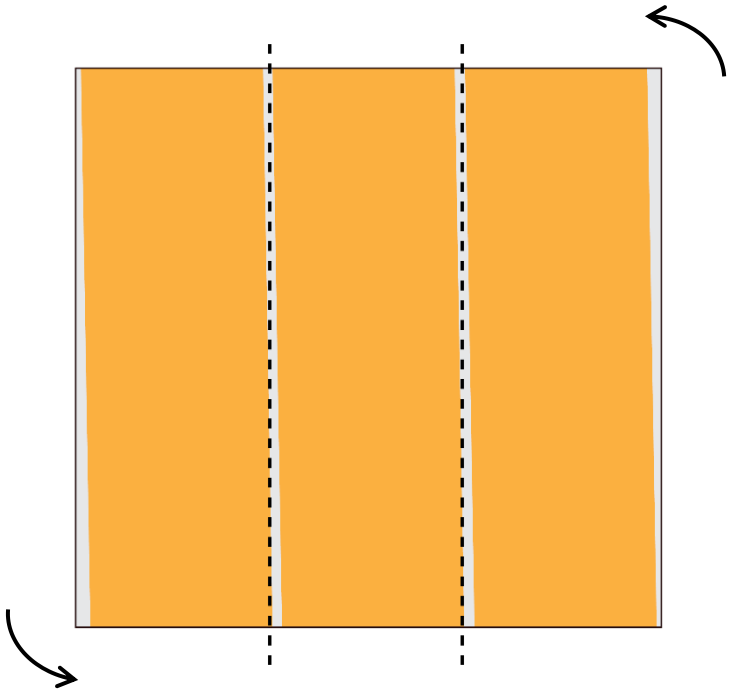

*Figure 9: Sheet that rotated / skewed sheet*

Moreover, defects can also occur in the slitter if sheets are not positioned properly at the slitter infeed. Even if the sheet is perfect, if it is not pushed and positioned correctly as it enters the slitter, the slitter will cut where it should not. One sensor would be able to detect positioning errors for both the coater and slitter.

# IV. THE SOLUTION

For a canmaker who is looking to get only the best value for his money, having as many sensors as sheet margins mean more cost on his part ---It is the best but also the most expensive solution.

The IS610 Plain Margin Inspector is the first sensor that will give you the biggest return on investment.

This sensor is the simplest, most inexpensive, and most practical solution to problems caused by contaminants on the margins of metal sheets. A notable issue it prevents is downtime due to broken weld wires.

It is an **auto-learning, self-calibrating sensor** with intuitive software assistance for sensor alignment. It has an easy-fit feature product housing designed to fit very close to the cutter blades.

It has a ***heartbeat signal*** to ensure it is still working and it will work for a long time. The IS610 works on clear lacquer and detects contaminants. It has a configurable output pulse period to sync with slitter machine input timing requirements. It comes with a special mounting kit for easy installation and adjustment which can hold several sensors.

Learn more about the product and how you can protect your machinery from damage. You can also check out Innosen's complete line of cost-effective sensors for 3-pc canmaking.