



PILKINGTON

A member of NSG Group

NSG

GROUP

2nd BLACK BELT Project in Sagunto: Breakage Reduction in Assembly Area

- Champion: E. González Masa
- Presented By: Javier Blasco
- Team Members: Julian Palacios, Benjamin Castillo, Antonio Pineda, Jose Luis Ortiz, Miguel Navarro

J. M^a Bernués Sanz, Marzo de 2.009

Problem

At the start of the project, the main problem in the Laminated Line Sagunto are Breakage .
There is a loss of 2,3 % in our yield.

Objective

The target of this black belt project is the reduction from 1.3% to 1% of assembly area breakage losses

Project Selection

XY Matrix

Project: [Select Project](#)

DEMO

View Results

Delete

Instructions

1 2 3 4 5 6 7 8 9 10

Output Variables	Economical impact	Interesting	Customer satisfaction	Mesurable	Internal Yield	People Plant's	Accessible	Chronic problem	Quality of life	Difficulties degree	Total Weighting
Output Ranking	4	1	3	3	3	2	2	1	5	2	26

Input Variables		Association Table										Rank	% Rank
1	Reduction PPM's model XX	1	2	3	1	2	3	2	2	2	1	48	15,53%
2	Reduction Time Change Produc.	2	3	1	3	3	3	2	3	1	1	52	16,83%
3	Improve internals losses	3	3	2	3	3	3	3	3	2	2	68	22,01%
4	Time clean mould Encapsulation	2	3	1	2	1	3	3	3	3	1	55	17,80%
5	Improve the function of supervisor	1	2	0	0	3	3	2	2	2	2	41	13,27%
6	Improve the product to clean the mould	1	3	2	2	1	2	2	1	2	2	45	14,56%
7													

Define

Savings

Target: Reduction from 1.3 % to 1 % of assembly area breakage losses, in Laminated Line.

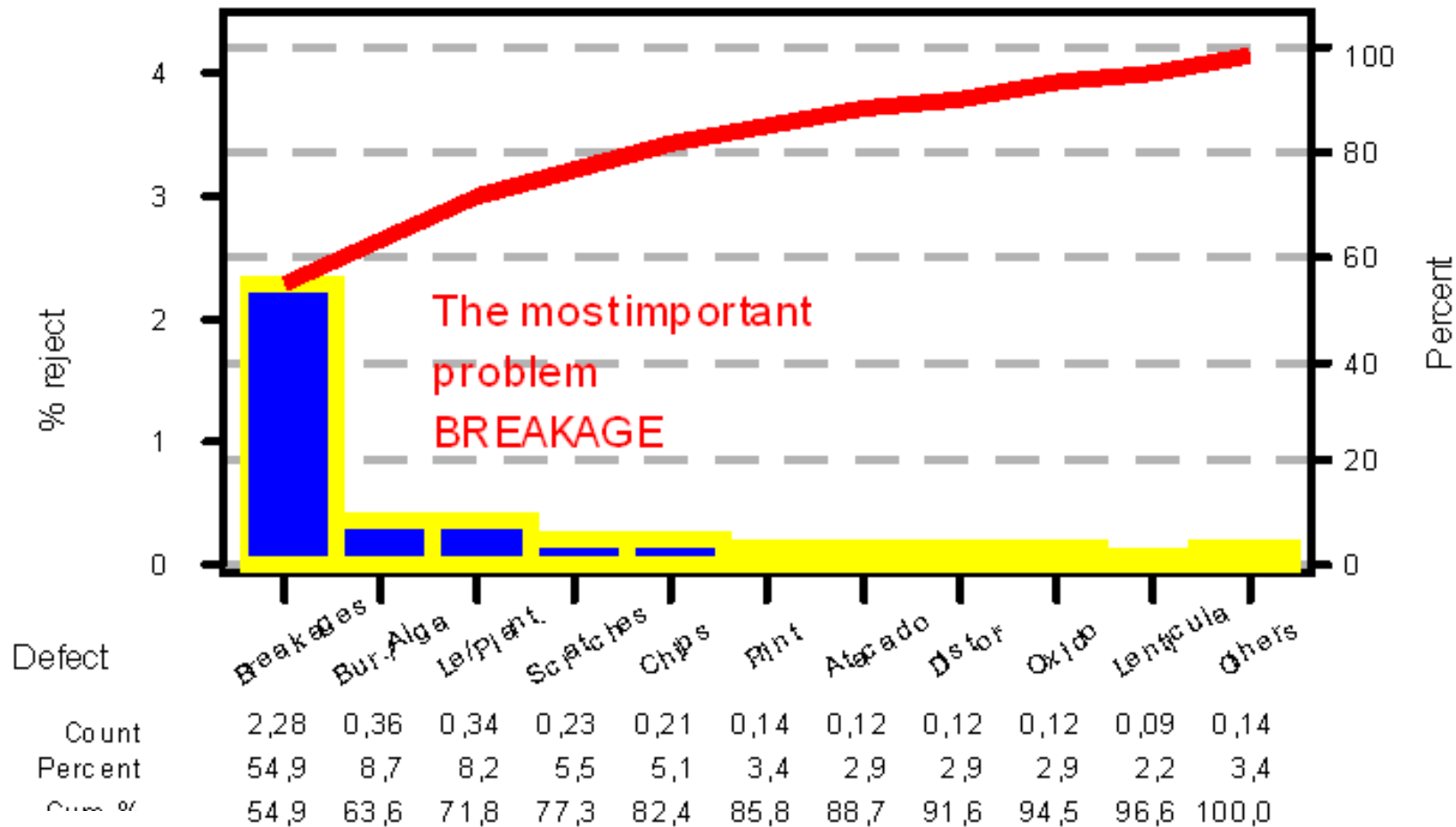
SAVINGS : 68.295 Eur / Year.

People Involved

- ✓ Champion: E. González Masa (PLANT MANAG
- ✓ 2 TEAM LEADERS (PRODUCTION)
- ✓ 2 P. IMPROVERS (NEXT GREEN BELTS)
- ✓ 1 MAINTENANCE AND ENG. TEAM LEADER.
- ✓ The team is opened to call more people for some specific tasks (Technical people, operators).

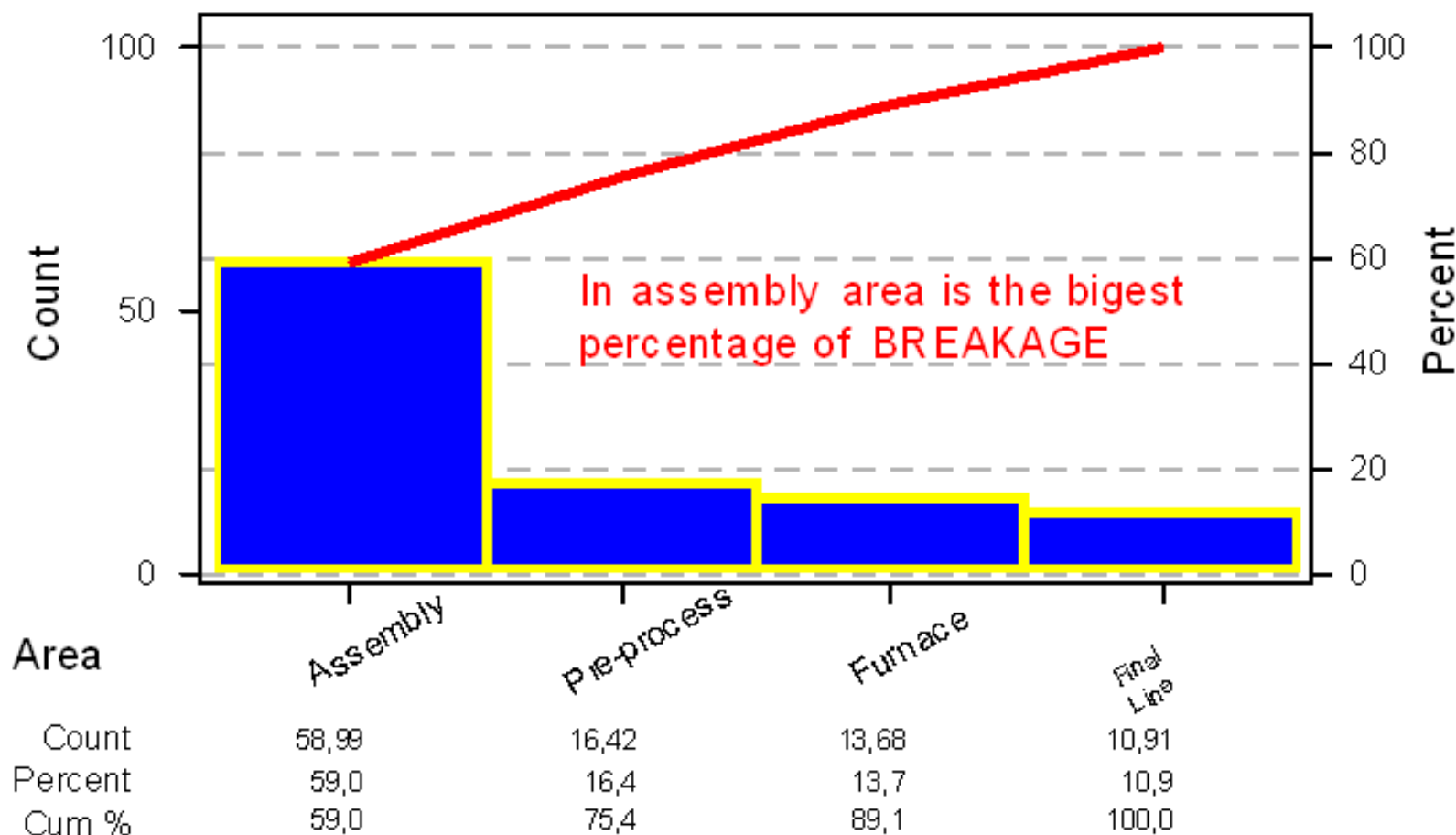
Main problem: Breakage

Percentage of defects in Laminated Line



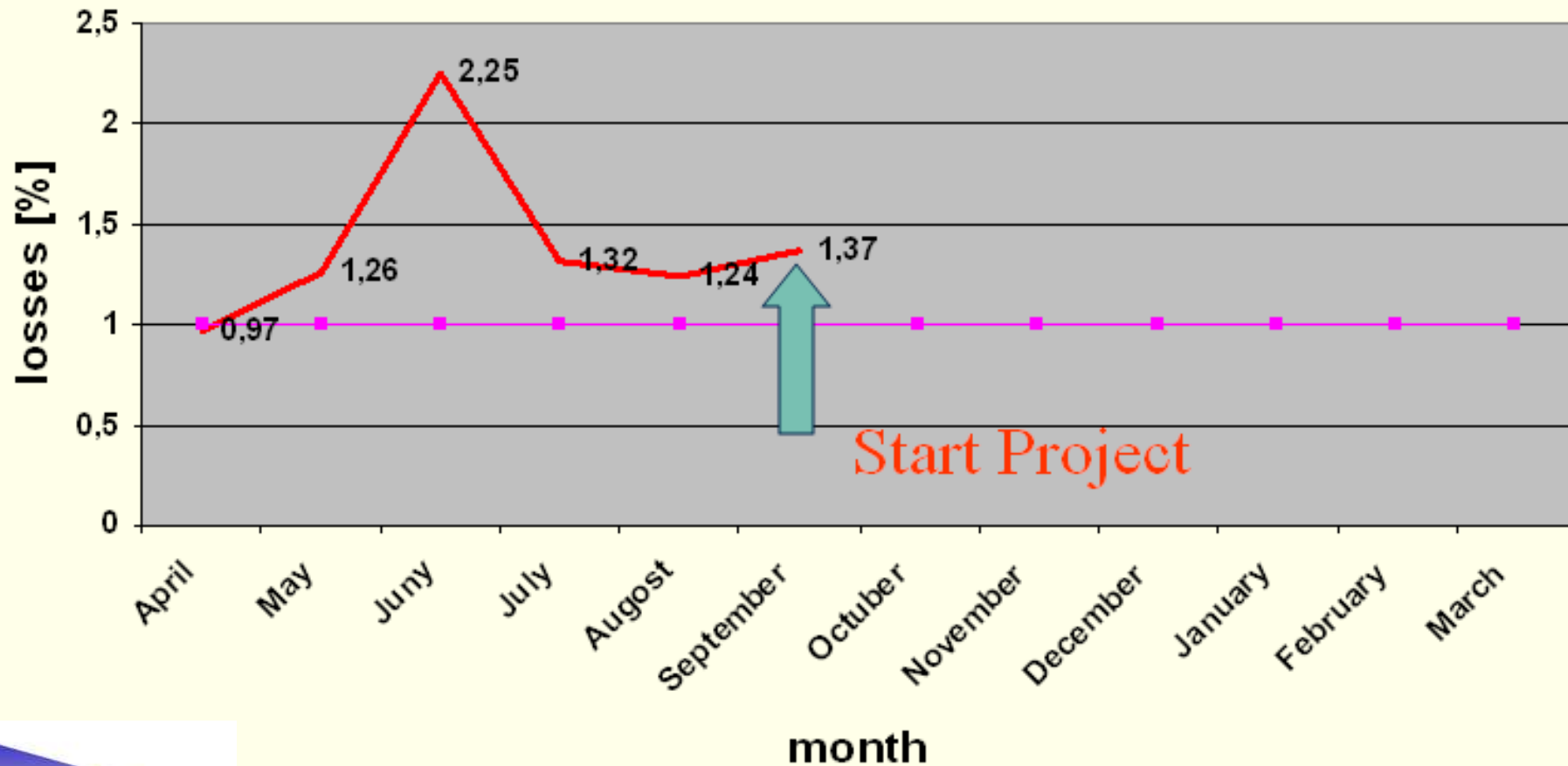
Where do We break glass?

Percentage of BREAKAGE per phase in Laminated Line



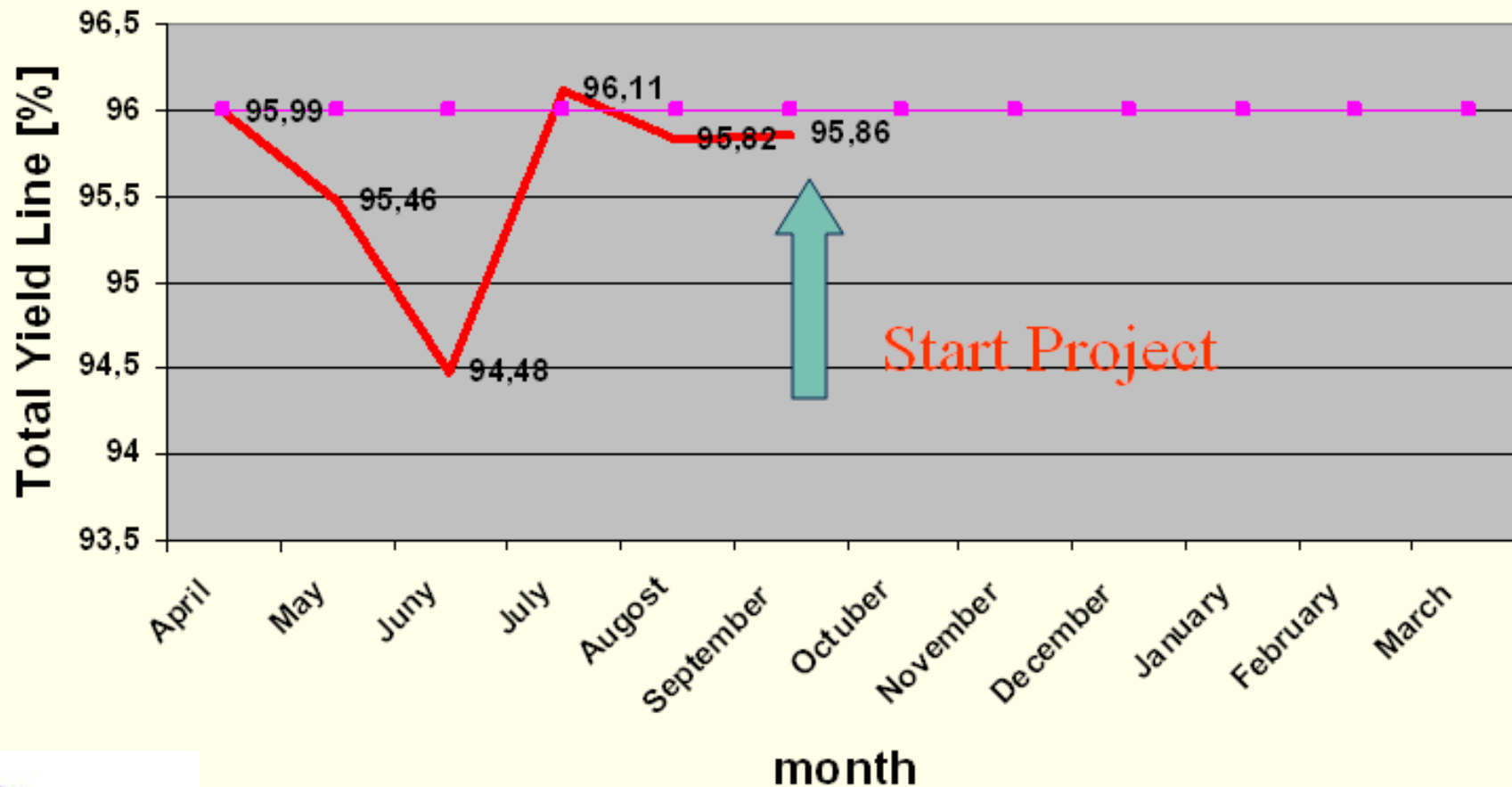
Primary metric: % breakage in Assembly area

Trend chart of % losses April - September of breakage at Assembly Area



Secondary Metric: Total Line Yield

Trend chart of % Total Yield in Sagunto Laminating Line April-September



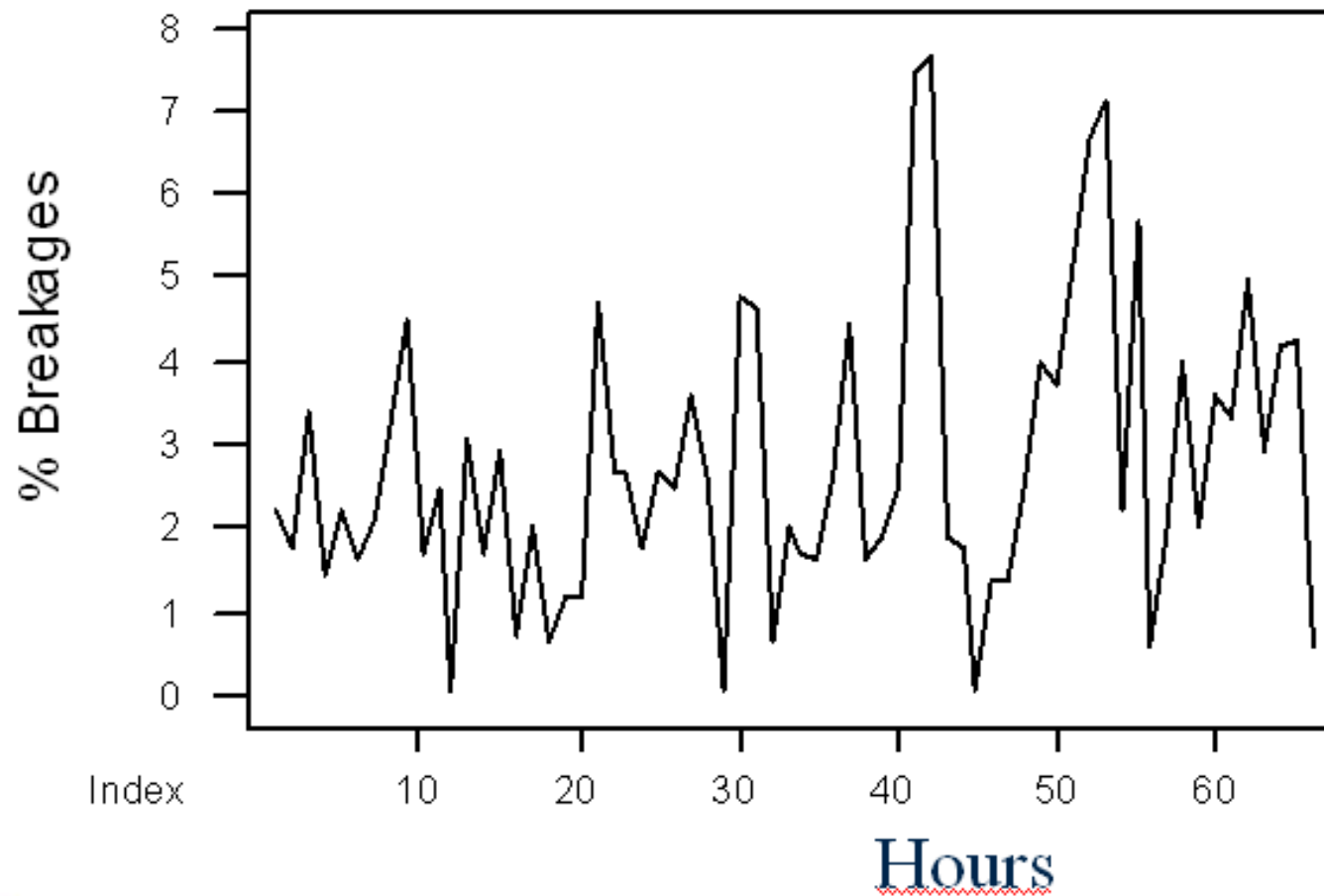
Actions

- ✓ New sheet in assembly (NIP ROLL) to collect the information about breakage every hour.
- ✓ Teach the operators to fill this sheet.
- ✓ Collect the information in a batch (LONG TERM). In the model XX.
- ✓ Find the relationship between the parameters of the assembly area and the breakage.

Analysis of % Breakage Time Series Plot

Parameters (inputs assembly) Model

Data collect by operators
Frequency (1 Hour)



How constant are the parameters?

✓ Glass temperature after first IR oven:

N=70 ; Mean = X9.9; St Dev= 0.5;

Set Point = X0 °C

✓ Glass temperature after second IR oven:

N=70 ; Mean = Y1.98; St Dev= 0.49;

Set Point = Y2 °C

✓ Cylinders pressure at both Nip Rolls:

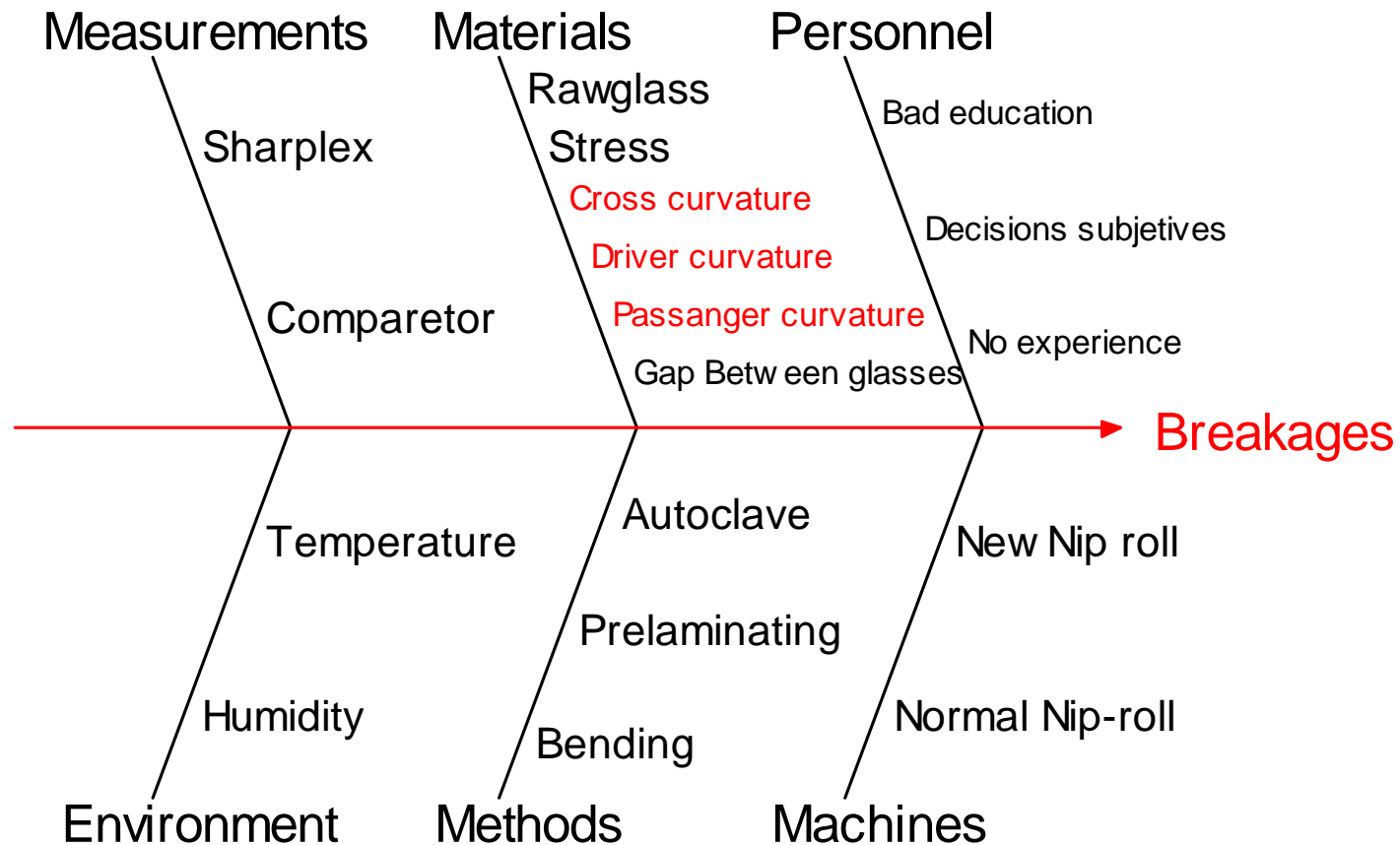
They are constant due to pressure regulators installed by each one.

Are there Any Causes in the Assembly Area?

- ✓ With the inputs in assembly area held constant, the percent of breakage is variable. Therefore, assembly inputs are not causing breakage.
- ✓ Next step : the team will look for another root cause using the cause and effect diagram.

Fishbone

Cause-and-Effect Diagram



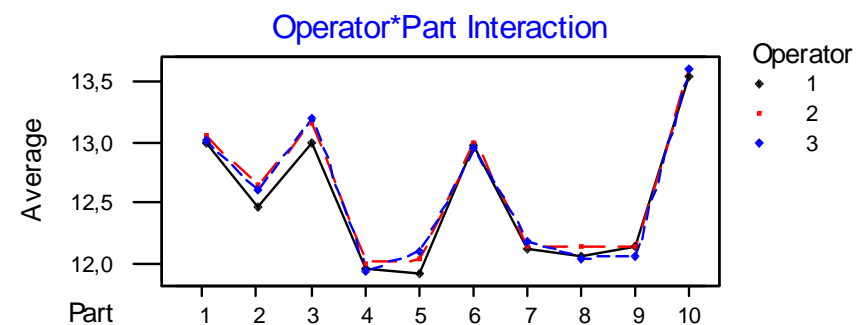
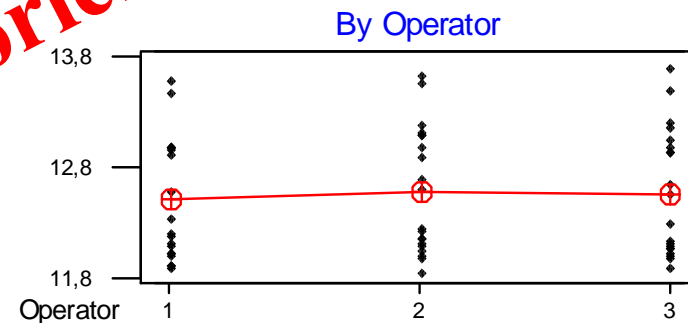
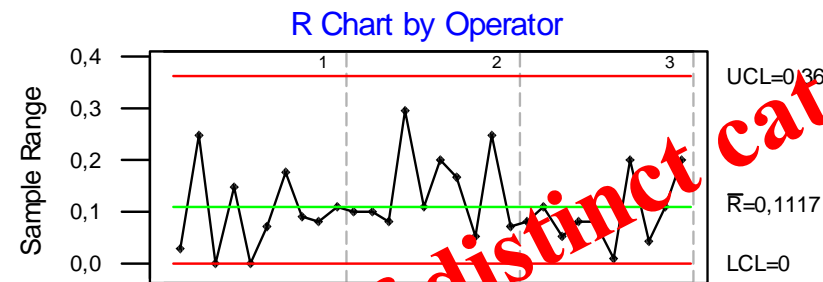
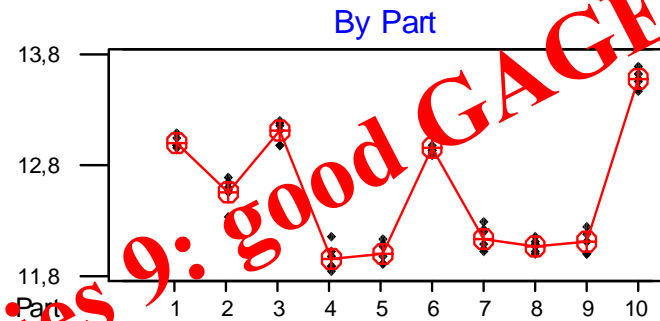
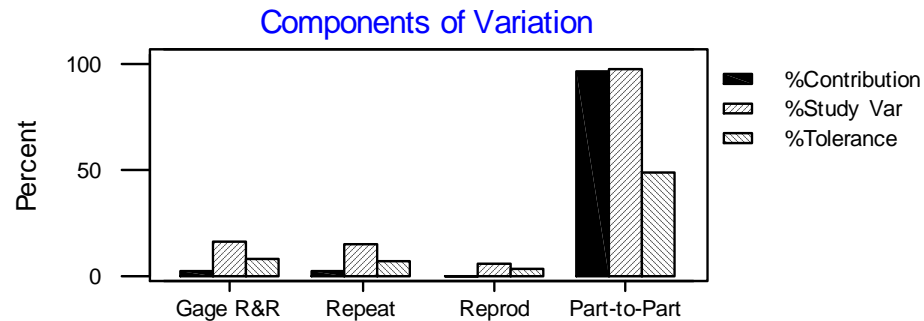
Activities

- The next batch (XX) inspect all the breakage. Classify breakage in groups.
- Teach the people in assembly area to measure the curvature with our traditional gage “comparator”.
- Measure the three curvature points on the broken parts (when possible).
- Measure thirty W/S that did not break and compare with broken WS curvature.

R&R Gage “Comparator” for cross curvature

Gage R&R (ANOVA) for Measure

Gage name:
Date of study:
Reported by:
Tolerance:
Misc:

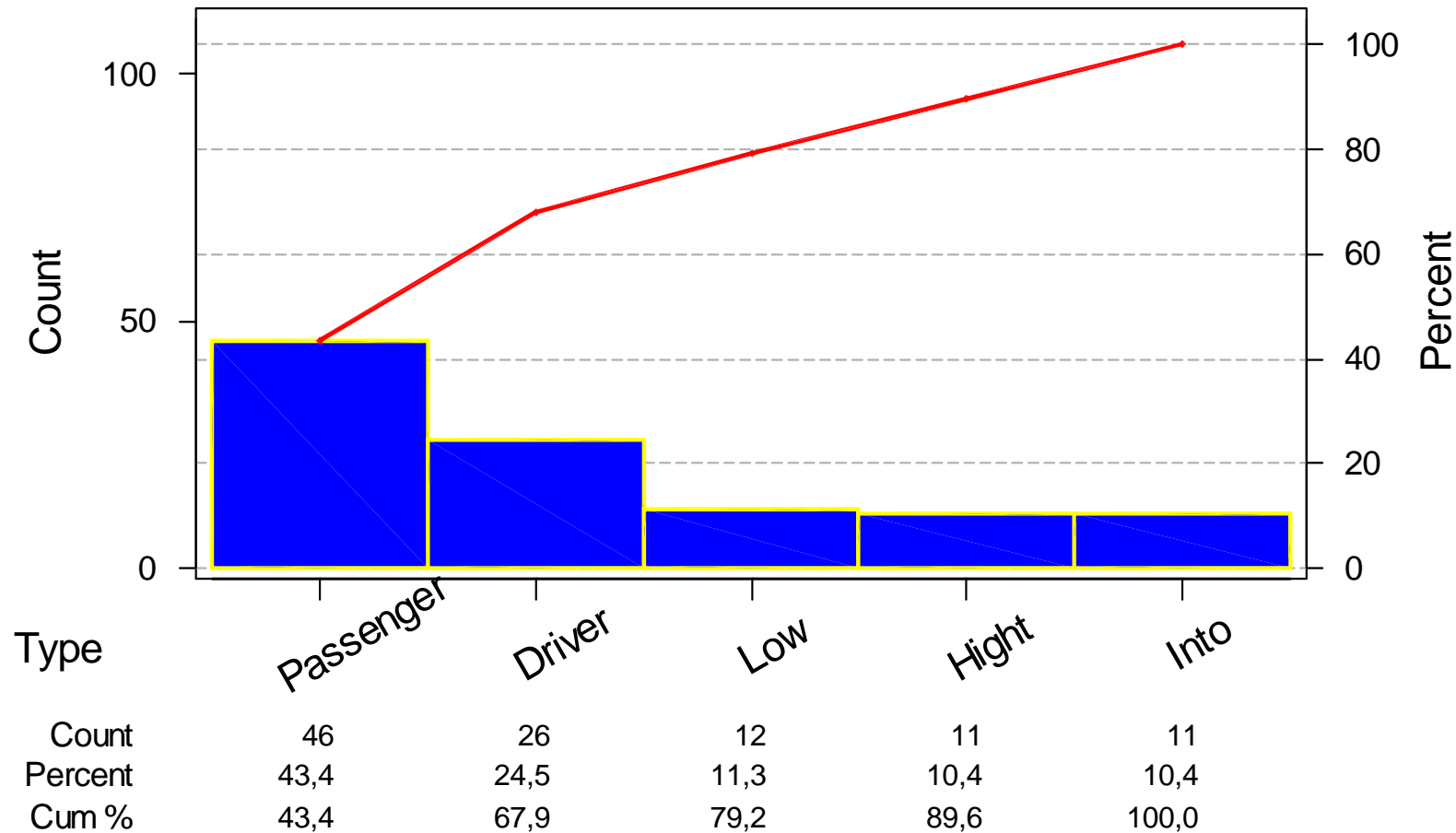


Study of Breakage

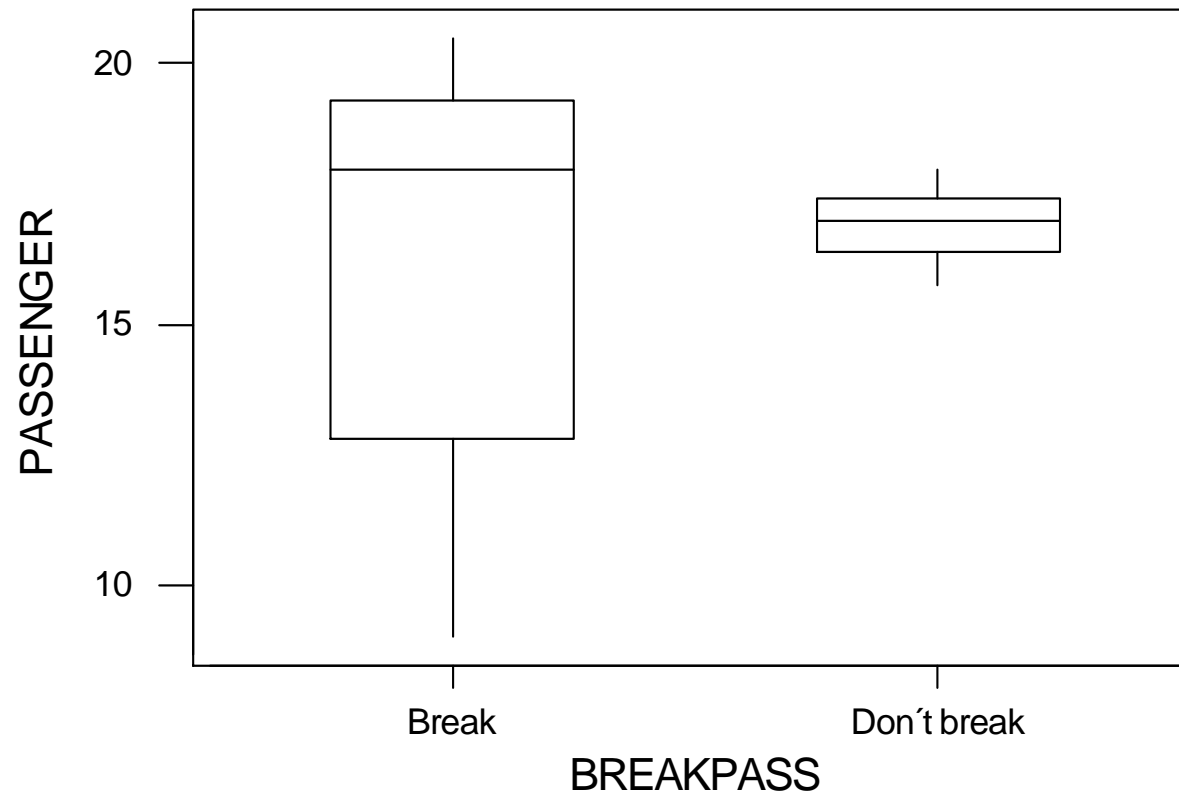
- Date: 23/26-10 model : XX.
- Long term : 11877; (107 pieces analyzed).
- Types of breakages:
 - 47 start at PASSENGER side; 44 %.
 - 26 start at DRIVER side; 24.2 %.
 - 11 HIGHT energy 10.2%;
 - 12 LOW energy 11.2%;
 - 11 start at INTO the WS;10.2%.

Breakages Pareto

Pareto Chart for Type of Breakages



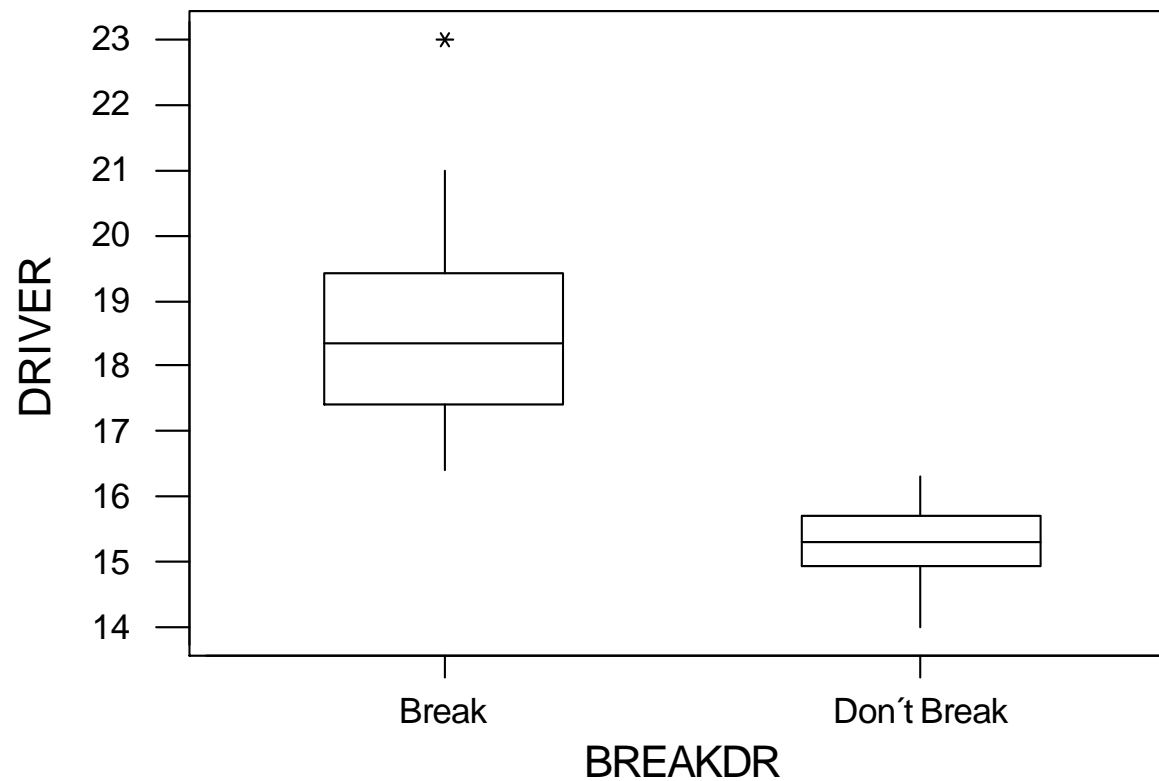
Analysis of the Curvature for PASSENGER and DRIVER



Scatter plot, curvature passenger-Break - Not Break



Analysis of the Curvature for PASSENGER and DRIVER



Analysis Conclusion

- The passenger and driver curvature is the most important cause of the breakage at assembly area (NIP ROLL).
- The curvature is due to variability in the glass and is an output (Y) of the furnace.
- The passenger and driver curvature aren't specifications of the customer.
- Only one curve is measured at the NIP ROLL. However, the WS has three curves (centre, driver, passenger) which affect breakage.

DOE (Passenger Side)

- ✓ Define the problem: Obtain a passenger curvature 17 mm.
- ✓ Establish the experimental objective: the 17 mm should have the minimal variability.
- ✓ Select the output (KPOV) response variables: curvature in mm.
- ✓ Gage study: OK
- ✓ Selection of the input variables (KPIV s)
- ✓ Chose the levels for the input variables

Problem

- We currently have high demand for our line, therefore it is not possible to do a trial in the lehr furnace. This DOE will be scheduled in the future.
- Next Action :
- REGRESSION WITH THE SAME PARAMETERS (Predictors). The response is CURVATURE.

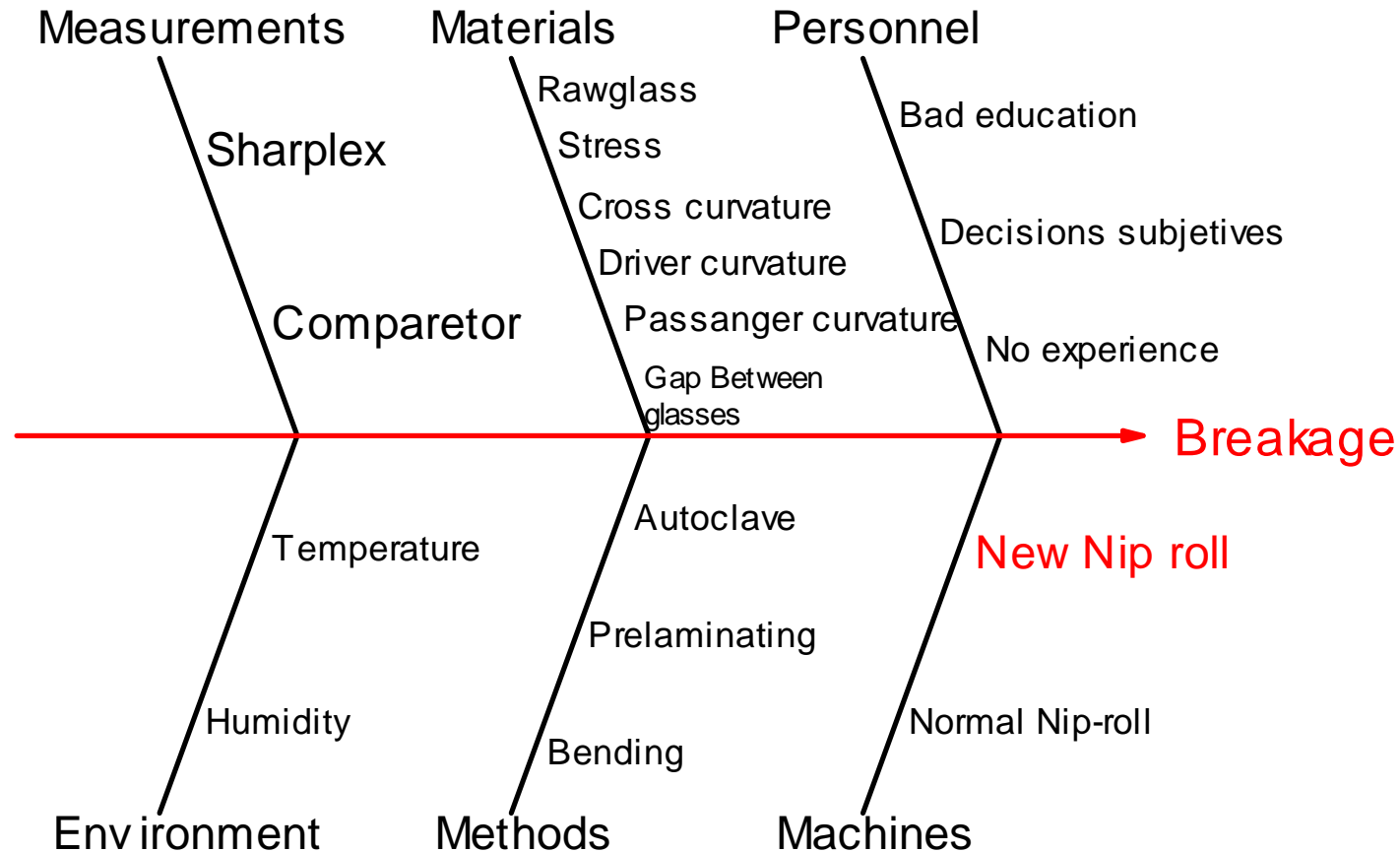
The regression equation

Using Minitab the equation for the CURVATURE is:

$$\begin{aligned}\text{CURVATURE} = & - 684 + 0,065 \text{ PDH} - 0,0084 \text{ DH} - 0,0946 \\ & \text{M1} + 0,151 \text{ M2} + 0,513 \text{ M3} - 0,709 \text{ M4} + 0,474 \text{ M5} + \\ & 0,222 \text{ M6} + 0,478 \text{ M7}\end{aligned}$$

Other Actions: Fishbone

Cause-and-Effect Diagram



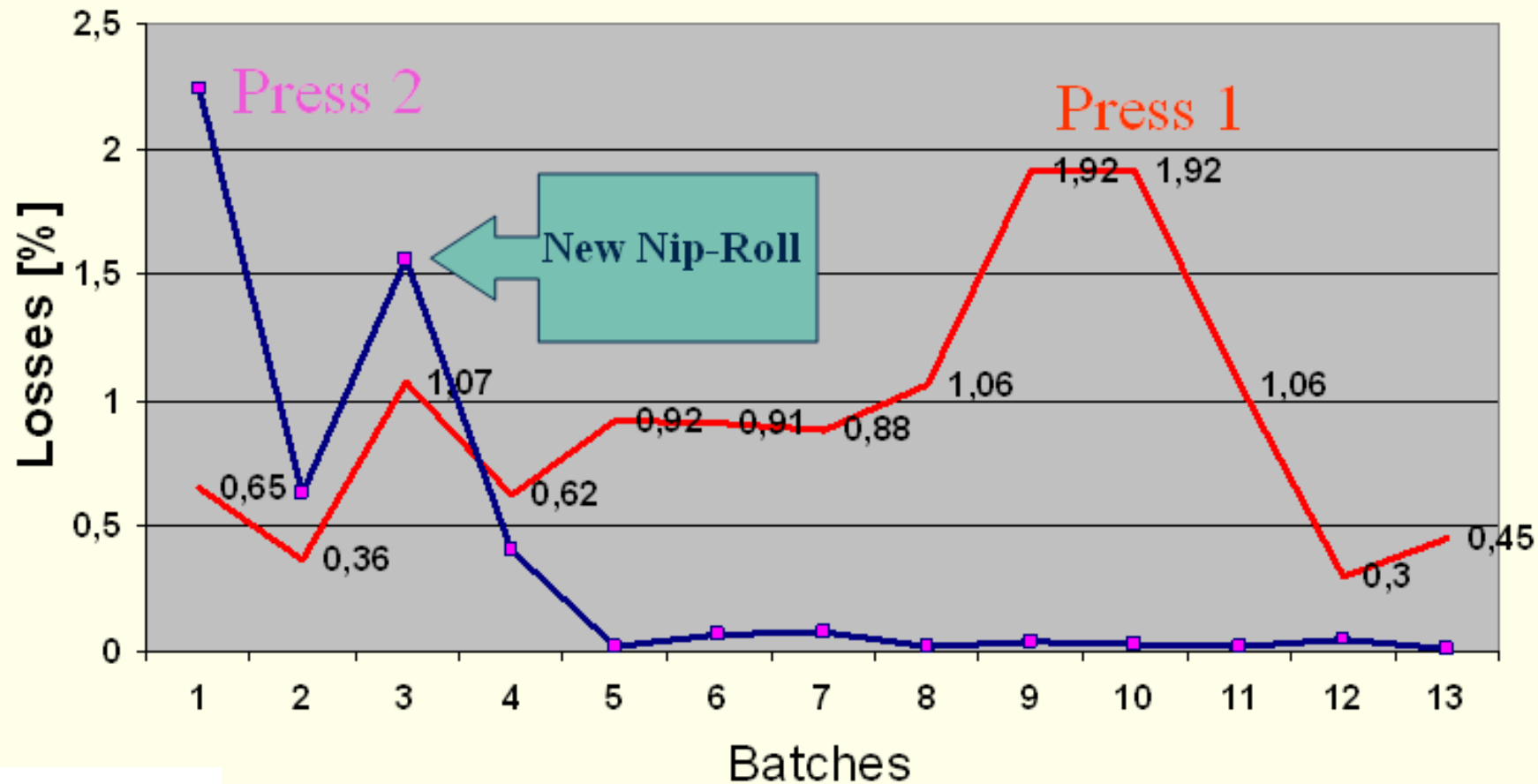
- In Sagunto we have developed a new NIP roll. (We have only one)
- Next action : to do a trial with this new nip roll at the 2nd place (after the second IR oven), and compare with other batches. (Model XX)

Nip Rolls



Evolution of breakage with the new nip roll

Trend chart of % breakage in each nip roll in the model XX per batches



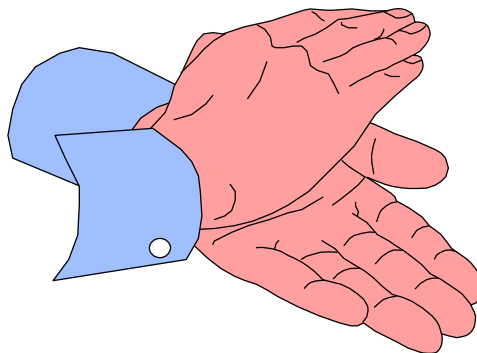
Next steps

- Produce all models with the new Nip Roll.
- Build another new Nip Roll to work with two new Nip Rolls in the two places.
- To patent new Nip Roll

Standardisation

- ✓ Collect Pre-press area breakage index. Update records & PFMEA
- ✓ Introduce new Nip Rolls as standard process for all products.
- ✓ To build another new Nip Roll for SMED.
- ✓ Send the information of the new Nip Roll to others plants that produce with Vertical Nip Roll system.
- ✓ Edit MST with best practice

THANK YOU QUESTIONS/ANSWERS





PILKINGTON

A member of NSG Group

NSG

GROUP
