



Ensuring Test Data Accuracy

Form Automation Kaizen



Cataler North America Background

- Subsidiary of Toyota Motor Corporation
- Cataler processes ceramic substrates in such a manner as to prepare the “catalyst” portion of the automotive catalytic converter.
- Process includes the application of various platinum group metals, such as Platinum, Palladium, Rhodium, etc.
- Given this, proper application of precious metals is of the utmost importance.



Powder Sub-Process Background

- Powder is used in the creation of “slurry”. Depending on the product line and specifications, this slurry can act as the direct filtration product for the catalyst; since the PGM is added directly into the powder, or it could act in conjunction with additional filtration processes.
- Regardless, the Powder operation is extremely critical to effective production at CNA.
- Originally all test check sheets were filled out manually. These check sheets could contain extremely complex formulas that powder operators were expected to fill out correctly.
- As one can imagine, before Mi-Forms automation, errors ran rampant in the process, due to the complexity of the formulas and the fact that the powder operation can act as the constraint for the rest of the production process.



Original Manual Process Overview

- Original Powder Check sheet forms were spread out across multiple documents, accessed by multiple departments.
- Quality Lab personnel received samples from the Powder department and performed associated tests, due to form complexity. Completed forms were taken to the Lab Supervisor for review and approval.
- Results and samples were then issued back to the Powder department and adjustments made accordingly.
- This operation further increased load at the bottleneck operation due to the cross departmental communication and mismatched shifts involved.
- Occasionally, check sheets were lost due to the completely manual nature of the process.
- Anytime a powder specification changed, a form change was required along with the associated document control processes. This occasionally led to erroneous check sheets in the Powder department.



POWDER NAME HR13-4040 ANALYSIS LAB _____
 Lot # _____ Drum # _____

SIGNED IN BY: _____
 DATE / TIME RECEIVED: _____ CHECKED BY: _____
 DATE INSPECTED: _____ INSPECTOR: _____

INSPECTION METHOD : PGM Load Amount and SOLIDITY

JUDGMENT OK · NG

		1	2	Average
SOLIDITY ≥ 93.0%	CRUCIBLE W1 (g)			
	CRUCIBLE + SAMPLE W2 (g)			
	600°Cx30 min W3 (g)			
	SOLIDITY CALCULATION (W3 - W1) × 100 / (W2 - W1)			
	NG (X) or GOOD (O)			

4) Calculation & Adjustment for Slurry Preparation

Details of work		Target weight	Result	Judge	Operator
Product Weight (100% Base)	$[E] = C \times D / 100$	30.48	Kg [E]	OK / NG	
Yield (as solid ratio 100%)	Yield = $[E] / 30.48$	100.00	≥ 99.3 %	OK / NG	
Target weight from chart			kg [F]	-----	
Adjust powder weight	≤ Target	Amount to add = F-C	kg	OK / NG	
	≥ Target	Amount to remove = C-F	kg		
Actual Weight		[F]	Kg	OK / NG	



New Mi-Forms Solution Overview

- In mid-2005 Charles Watkins came on board at CNA as our lead developer. While analyzing the need for automatic check sheet processes, Charles drew from his past automation contacts and presented Mi-Forms to me as a possible solution.
- Once Mi-Forms was chosen as the solution of choice, Charles took the reigns in its' implementation and maintenance.
- Powder Check sheets have been compressed into one easy-to-use form in Mi-Forms.
- Because the form is easy to use, responsibility for the powder testing has shifted to the Powder department, removing the original production bottleneck. The new form removed the need for highly trained lab technicians to perform the test, reducing the need for additional technical headcount.
- Check sheet sessions are obviously now stored server-side, so check sheets cannot be lost. The web interface allows the Lab Supervisor to perform approvals in Mi-Forms which allow the Powder Department to perform adjustments.
- While developing the new automated form, Charles discovered an engineering error in the manual form, which was causing ALL test results to be erroneous. This error was not caught, due to the complexity of the manual form.



Detailed Mi-Forms Solution

- Entry fields were simplified as much as possible. One Mi-Form replaced about 20 manual forms because originally each powder part number had its own form. Part numbers and associated data specifications are pulled from a backend SQL Server database.
- This design allows specification changes to occur without re-designing the entire form.
- Data is entered via handwriting recognition on a tablet PC, thus allowing the user procedure to remain relatively unchanged and minimize the need for re-training.
- All calculations are performed behind the scenes removing the possibility of arithmetic errors from the powder personnel.
- Test results are given in a visual manner to allow for quick determination of powder failure.
- Adjustments are given automatically without the need for further analysis that would impede the efficiency of the process.
- The web interface allows CNA Management and personnel to quickly reference testing data that may be requested by the customer.
- Critical analysis data is pushed back into the SQL Server as well as the Mi-Forms Server. This allows quick custom reporting on the result sets.

POWDER NAME
TL13-5150

Lot #
TL 071108

IN-PROCESS INSPECTION

Notes:

Notes area (empty)

Inspector:

Inspector: CS

Inspection Methods
SOLIDITY

JUDGEMENT **OK**

Target Weight (100% Dry Powder)	82.56	1	2
CRUCIBLE W1 (g)		25.92100	26.01700
CRUCIBLE + SAMPLE W2 (g)		29.65500	30.10600
Min. 600°Cx60 min		29.62600	30.06900
Max. SOLIDITY CALCULATION (W3 - W1) x 100/(W2 - W1)		99.22	99.0951 (A) 99.16
NG (X) or GOOD (O)		O	O

Grind Weight	84.52	Final 100% dry weight	83.81
Final Product Weight	(B) 83.26	Add this amount	
Yield (as solid ratio 100%)	101.51	Remove this amount	1.26



Summary - Questions

Based on the initial Powder Dept. and Quality Lab implementation, CNA plans to roll Mi-Forms out to almost all areas of the production floor.