

## Example<sup>1</sup> Root Cause Analysis Report

*Focal Point: Manufacturing Non-Conformance*

Report Number: 522012  
 Report Date: 05/02/2012  
 RCA Owner: John Smith

### Problem Statement

**Focal Point** Non-Conformance Reported on Brass Tubesheet 1324

#### When

Date:	05/02/2012 - 05/03/2012
Unique Timing:	During increased production schedule, After 11 straight 12 hour night shifts

#### Where

Location:	Morrow Corporation, 4413 Hwy 67 Laporte, TX 77572
Location:	Machine shop, boring mill #3, cnc drill #2, radial drill #2

#### Impact

	Actual	Potential	Cost:
Customer Service:	Late Production Schedule Concession	Potential supplier downgrade	\$1,000.00
Revenue:	Lost on-time production bonus	Potential lost customer	\$6,000.00
Cost:	Scrapped brass		\$ 1,400.00
	Overtime Labor	Potential more overtime to cover re-fabrication	\$2,200.00
	Retooling and Setup		\$500.00
<b>Total:</b>			<b>\$11,100.00</b>
Frequency:	4th occurrence this year of NCR and scrapped tubesheet		

<sup>1</sup> Note: This is an example only! All information used in this report comes from the public domain. It is intended to demonstrate the steps and format of the Sologic™ root cause analysis method and Causelink™ software. For questions or comments, please contact us at [www.sologic.com](http://www.sologic.com)

## Cause and Effect Summary

On May 2, 2012 quality control issued a non-conformance for project #1234 (brass tubesheet). The non-conformance was issued due to an incorrect bolt pattern (34 hole pattern drilled and 36 hole pattern required) and scratched gasket surfaces.

The incorrect bolt pattern was caused by an engineering oversight and no quality check from the drill operator after spot drilling. Engineering provided the CNC drill operator with a design used one month prior for the same customer. Engineering was not aware the the bolt patterns were different. Engineering used the previous program/design to reduce design costs to the customer. The CNC operator only checks spot drilling for hole locations and uniformity. It is not typical for the CNC drill operator to check the hole locations against the blue print during this stage in production, and the operator assumed the program provided from engineering was correct.

The scratched gasket surface was caused by missing gasket material between the radial drill table clamps and the tubesheet. Missing gasket material between the raising blocks and the tubesheet also generated additional scratches to the gasket surface. The 2nd shift radial drill operator has not been formally trained on setup and has not had to setup a pieces/project for work. Historically the 2nd shift operator has completed setup prior to end of shift, but in this case the 2nd shift operator did not have time to setup. The 2nd shift operator has also never worked on brass tubesheets before. The 2nd shift operator is new to the organization and has only been here 5 weeks.

## Solutions

<b>ID:</b>	<b>Label:</b>	<b>Item:</b>
<b>1</b>	Cause: Solution: Assigned: Due: Term: Note: Est. Cost:	Only checked drill tip spots for uniformity Implement Standard Operation Procedure to verify hole location with drawings and engineering Brian Hooghess 05/11/2012 Long Require quality control check after spot drilling with engineering, design, and customer request. \$0.00
<b>2</b>	Cause: Solution: Assigned: Due: Term: Est. Cost:	Gasket material not located near radial drills Relocate gasket material near machinery that require clamps Mel Eggbert 05/11/2012 Medium \$0.00
<b>3</b>	Cause: Solution: Assigned: Due: Term: Note: Est. Cost:	Previous shift employee did not complete setup Require parts secured at the end of every shift. No parts left unsecured. Mel Eggbert 05/31/2012 Long Train and implement procedure for work process to require parts be secured at the end of every shift. \$1,200.00
<b>4</b>	Cause: Solution: Assigned: Due: Term: Note: Est. Cost:	Clamps scratched top gasket surface Adhere gasket material to bottom of all clamp surface Theodore Nugent 05/18/2012 Medium Implement clamps as part of tool check-out requirement, and have the tool warehouse maintain clamps with approved gasket material \$500.00

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<b>5</b>	<p><b>Cause:</b> 2nd shift employee not familiar with tubesheet setup</p> <p><b>Solution:</b> Require material handling training for both raw materials and materials in process</p> <p><b>Assigned:</b> Mel Eggbert</p> <p><b>Due:</b> 06/22/2012</p> <p><b>Term:</b> Long</p> <p><b>Note:</b> Implement material handling into new employee training.</p> <p><b>Est. Cost:</b> \$600.00</p>
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<b>6</b>	<p><b>Cause:</b> Tubesheet does not meet design specifications</p> <p><b>Solution:</b> Implement standard operation process of engineering designs being quality control checked prior to manufacturing</p> <p><b>Assigned:</b> Brian Hooghess</p> <p><b>Due:</b> 05/18/2012</p> <p><b>Term:</b> Long</p> <p><b>Note:</b> Introduce and mandate QC check of blueprints and drawings before manufacturing begins. QC to reference blueprints/drawings with customer before signing off approval for production</p> <p><b>Est. Cost:</b> \$0.00</p>
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★ Non-Conformance Reported on Brass Tubesheet 1324




🎯 Tubesheet does not meet design specifications

■ Exterior bolt pattern does not meet design spec

■ Calls for 36 bolt pattern

■ Design specifications

■ CNC uses program from engineering 

■ Pattern engineering provided was 34 bolt pattern

▶ Used previous design

■ Unaware spec was different from previous job

▶ CNC drilled 34 bolt pattern

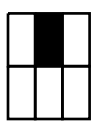
▶ CNC operator did not catch on initial spot drilling

▶ Only checked drill tip spots for uniformity

▶ Did not check bolt pattern for accuracy

▶ Secured tube sheet with radial drill table clamps

■ Table clamps used to secure part to table



Customer ordered similar tube sheet 1 month prior

Reduce design costs to customer

Didn't know this design was for 36 bolt pattern

QC not performed on final drill design

Normal practice to prevent incorrect hole size

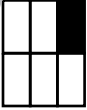
Prevent drill walking for incorrect tube hole location

Assumed CNC program was correct

Cut serrations into tube holes

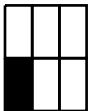
tubes need to be rolled into tube sheet

serrations hold tubes in place



■ Design specifications req'd from customer

▶ Tubsheet gasket surface scratched





Clamps scratched top gasket surface

Use of radial drill required

No gasket material between clamp and tubesheet

Employee did not know gasket material needed

Gasket material not located near radial drills

Raising blocks scratched bottom gasket surface

No gasket on aluminum raising blocks

Previous shift employee did not complete setup

Raising blocks used to raise tubesheet off table

2nd shift employee not familiar with tubesheet setup

Gasket surface easily scratched

Brass is soft metal

