Improving The Raw Stock Process

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Integrative Project – SELP
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Agenda

- Project Introduction / Definition
- Examples Of Failures
- Why Is It Important?
- Project Objectives
- Original Process vs. Updated Process
- Summary
- Follow-on Phase

Project Introduction

- Raw stock is raw material used to make parts
- Raw stock clerk left unexpectedly
  - Clerk for over 30 years – single point failure
- For several months new raw stock was being ordered and was piling up in the stock room
- When I came across the problem, there was a 6 month backlog of material in the raw stock room
- No documented process for receiving, verifying, storing, and retrieving raw stock
- Process deficiencies were masked – problems surfaced
Raw Stock Definition
- Raw Stock is base material that is analyzed, tested, and certified to be machined into Space qualified parts
- Examples include copper, iron, steel, nickel, cobalt, gold

Wrong Materials Can Cause Catastrophic Failures
- Titanic
  - Rivets made of weaker iron
- Liberty ships
  - Steel became brittle in lower temp.
- Napoleon's Buttons
  - Tin pests
Raw Stock Important At My Company

- Raw materials used to make simple parts such as baseplates to complicated electron emitters
- All vacuum assemblies require parts that are machined from raw stock
  - 80% of our final products use vacuum assemblies
- Important to get the right parts, at the right time, and at the right price
  - Wrong material: functions incorrectly – unhappy customers
  - Not on time: schedule shifts, cost increases – unhappy customers
  - Expensive: cost increases – unhappy customers

↑ Quality, ↓ Time, ↓ Cost = 😊 Customers

Project Objectives

- Develop/Improve process for ordering, receiving, verifying, storing, and retrieving raw stock
  - Define criteria for materials and services purchased
  - Create partnerships with suppliers
  - Organize data received with material
  - Provide proper equipment and software to reduce time and money
    - Implement 5S (Sort, Straighten, Sweep, Standardize, Sustain) practices in the raw stock room
- Save money for the company by reducing the time and cost of the process, while ensuring quality and reducing escapes
- Improve the system so there is confidence that there are no ethical issues
Project Approach

- Became the team lead
  - Team included representatives from procurement, receiving lab, raw stock room, supplier quality, inspection, Materials & Processes (M&P)
  - Team met frequently and consistently for status
- Company has a union, and certain rules had to apply
- Interviewed process owners about current practices
- Received buy-in from all different levels of management

Request For Material From Product Line

Order Material From Supplier

Purchase Order (PO) To Supplier

Before
Who: Purchasing Process:
- Generated POs that did not clearly state what was required
- Made decisions without engineering authorization
  - Cut delivery time by settling for less testing by supplier

After
Who: Purchasing Improved Process:
- Created template POs to include specifications/special notes for the material
- Stopped making unauthorized changes

Time: 97.5% Imp.
Cost: $86.6% Imp.
Before
Who: Supplier
Process:
- Specifications were unclear and outdated
- Some alloys months lead time
- Only minimum required tests were performed because suppliers were unclear
- Many unnecessary suppliers (~50)

Time: 8:00
Cost: $8

After
Who: Supplier
Improved Process:
- Updated specifications
- Started to order more off the shelf material
- Contacted suppliers directly
- Required supplier to perform more tests
- Decreased number of suppliers (~25)

Time: 5:30
80% Imp.
Cost: $3
20% Imp.

Before
Who: Receiving & Raw Stock Clerk
Process:
- 6 month backlog of material
- Each clerk had separate receiving processes
  - Accepted w/o proper paperwork
  - Misfiled/Lost paperwork
- Paper catalog of Part #s w/ type/size/shape of material

Time: 10:00
Cost: $10

After
Who: Raw Stock Clerk
Improved Process:
- Improved tracking of material
- Requested required paperwork present before deliver/er leaves
  - One clerk became responsible for raw stock receiving
  - Organized system for immediate filing
- Created electronic catalog

Time: 4:30
98.8% Imp.
Cost: $4
93.3% Imp.
Material Ready For Inspection Data Sheet Steps

Is There An Inspection Data Sheet (IDS)?

Generated IDS

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Before
Who: Supplier Quality Engineer
Process:
- IDS for every Part Number (P/N) of raw stock (> 3,000)
- New P/N did not always have an IDS – noticed after material came in
- IDSs stored on separate drive
- IDSs were outdated and unclear

Time: 97.5% Imp.
Cost: $80.0% Imp.

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After
Who: Supplier Quality Engineer
Improved Process:
- Started to decrease number of IDSs (currently < 1000)
- IDSs now created when a type of material is ordered that does not have an IDS
- Linked IDSs to the electronic database
- Updated IDSs to be clear and simple to understand and follow

Time: 90% Imp.
Cost: 95% Imp.

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Material Ready For Package Verification

IDS – Verify Packaging

Material (Package Verified)

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Before
Who: Raw Stock Clerk
Process:
- IDS did not specify what to look for (i.e., packaging to prevent contamination)
  - Embedded in the spec
- Task performed by non-degree, lower category union employee
  - Needed help to understand specification every time

Time: 97.5% Imp.
Cost: $80.0% Imp.

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After
Who: Receiving Inspector
Improved Process:
- Added packaging requirements into IDS
- Task performed by a higher category union employee

Time: 90% Imp.
Cost: 95% Imp.
Before
Who: Multiple People
Process:
- If material has enough space, raw stock clerk used handheld XRF (X-ray Fluorescence) machine
  - Outdated
  - Verified simple material, not different alloys
  - Limited capability
  - Unsafe radioactive material

Time: [Clock icons]
Cost: $[Five dollar signs]

After
Who: Raw Stock Clerk
Improved Process:
- New XRF machine procured
  - Included barcode scanning capability
  - Was easier to interpret data (Copper instead of Cu)
  - Was able to have different alloys programmed
  - Was much safer

Time: [Clock icon]
Cost: $[One dollar sign]

80% Imp.

Before
Who: Multiple People
Process:
- 80% of the time, samples were sent to M&P lab
  - 6" samples wasted material
  - Highly paid M&P engineers did the work using sophisticated machines
  - Outside labs were used if M&P could not verify

Time: [Clock icons]
Cost: $[Five dollar signs]

After
Who: Raw Stock Clerk
Improved Process:
- New XRF machine procured
  - Did not need as much space for a reading
  - Rarely material is sent to M&P for verification

Time: [Clock icon]
Cost: $[One dollar sign]

100% Imp.
Equipment Used To Verify Material
Before
Who: Raw Stock Clerk
Process:
- Sometimes C of C never received or misplaced
- C of C had formatting errors and missing data
- Clerk needed help looking through specification to confirm if C of C values within limits

Time: 80% Imp.
Cost: $80% Imp.

After
Who: Receiving Inspector
Improved Process:
- C of C is present before deliverer leaves
- Supplier improved C of C formatting and information
- M&P created excel worksheets to capture info and highlight out-of-spec values

Time: 80% Imp.
Cost: $80% Imp.

Before
Who: Multiple
Process:
- Sometimes special testing is required to verify tensile strength, hardness, permeability
- For quicker turnarounds, only minimal tests were performed
  - M&P or outside labs were then obligated to perform the tests

Time: 100% Imp.
Cost: $100% Imp.

After
Who: Supplier
Improved Process:
- Worked with suppliers so they understood what tests we needed to be performed
- Difficult suppliers were removed from authorized supplier lists

Time: 100% Imp.
Cost: $100% Imp.
### Before

**Who:** Raw Stock Clerk  
**Process:**
- Material was stored randomly in raw stock room  
- Usually remained where it was placed by the deliverer  
- Room filled to capacity every day

**Time:**  
Cost:

### After

**Who:** Raw Stock Clerk  
**Improved Process:**
- Organized room using 5S practices  
- Started ordering material in shorter lengths or were cut to fit  
- Included locations in database so each material had its place  
- Labeled shelves numerically

**Time:**  
80% Imp.  
Cost:

80% Imp.
What The Raw Stock Room Currently Looks Like
What The Raw Stock Room Currently Looks Like
What The Receiving Shelf Currently Looks Like
Material Stored
Approved For Use
Retrieve
Material
Material To
Product Line

**Before**
Who: Raw Stock Clerk
Process:
- No designated area for each material
- Clerk went by memory to find material
- Had to dig through layers of material

**After**
Who: Raw Stock Clerk
Improved Process:
- Currently takes a couple of minutes to retrieve
- Product line can make a phone call, and the material is ready for pickup by the time they arrive

**Time:** 96.6% Imp.
**Cost:** 96.6% Imp.
### Summary

**Before**
- Backlog
  - 6 months
- Failures during mfg
  - 1 - 2 / month
- Total time
  - 62 weeks
- Total cost
  - $32,275

**After**
- Backlog
  - Zero
- Failures during mfg
  - Zero
- Total time
  - 4 weeks, 1D, 5H
- Total cost
  - $5,025

Total Savings: 58 weeks; Total Savings: $27,250 per material lot

### Follow-on Phase

- Inputting C of C data into worksheets to verify values in specification
  - M&P group currently doing most of them today
  - Receiving inspection just starting to do it themselves
- Decreasing number of IDSs in the system
  - Started to decrease, but goal to have only one or two per material type
- Suppliers can still decrease supply time
  - Continuing to work with them to understand their problems and help improve turnaround times
Team Achievement Award

is presented to

Questions?

as a member of

Raw Stock Inspection Team

for accomplishments

of major significance to L-3 ETI

May 5, 2008

President