Implementing ERP for Remanufacturing

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Presentation Outline

• Introduction
• Remanufacturing Background
• Contrast of Remanufacturing with Manufacturing
• Methods for Reconciling Differences (Case Study)
• Major Unique Aspects of Remanufacturing
• Supply Chain Planning
Presentation Outline, cont.

• Inventory
• Bills of Material
• Routings
• Finance
• Accurate Transaction Reporting
• Metrics
• Summary

Introduction

• Remanufacturing:
  – form of recycling that reuses machines that no longer work
  – Disassemble to repair, recycle, or harvest part
Introduction, cont.

Diamond
MPS/MRP
Manufacturing

Disassembly

Remanufacturing Background

- Productivity of manufacturing increased 300% in 50 years
- Current trend material productivity initiatives
- Material substitution – reduced input and weight
- Recycling – awareness and legislation
- REMAN ultimate form of recycling
Remanufacturing Background, cont.

- Conserves raw material and value-added content of original process

  Represents America’s largest untapped opportunity.

Remanufacturing Background, cont.

- **Refurbishing** – repairing an item by inspecting parts and restoring to like-new condition

- **Repurposing** – takes unit apart and removes parts still working to use in other machines
R emanufacturing Background, cont.

• REMAN underpinnings
  – Economic – massive and expensive products
  – Public or governmental regulations – waste reduction, energy conservation, protect ground water, etc.

R emanufacturing Background, cont.

• European examples
  – 15% of a vehicle can be scrapped
  – A certain percent of a new vehicle must use REMAN parts
  – USA requires labels on products recycled or remanufactured
Contrast REMAN with Manufacturing

- Difficulty of forecasting
- Used cores are primary source of supply for parts
- Number of usable parts from cores not known until inspected
- Disassembly by and reassembly – different skills/equipment
- Skilled technicians required

Methods for Reconciling Differences – A Case Study

- Implementation of an ERP system
- Importance of a pilot – none
- Full-time implementation team
- Objectives and benefits
  - Obtain rapid order fulfillment
  - Improve demand planning forecasts
Methods for Reconciling Differences – A Case Study, cont.

- Methods for streamlining operations
- Financial viability
- Right equipment, right parts, right time
- Use an integrated ERP software package

Major Unique Aspects of Remanufacturing

- Disassembly
  - Identify anticipated wear parts
  - Clean and inspect all other parts
  - Determine reclaim by repair or use as is
  - Determine other parts worn unexpected (replacement lead time must be accurate)
Major Unique Aspects of Remanufacturing, cont.

• Basic accuracies
  – Bills of Material
  – Routings
  – Inventory
  – Transaction reporting

• Lifecycle Management (PLM) manage from
  – Conception
  – Design
  – Manufacturing
  – Service
  – Disposal
Supply Chain Planning

• Philosophy of remanufacturing
  — Repair rather than buy
  — Determine interchangeability and substitutability
  — Recognize mortality and recovery rates
  — Time-phasing of supply actions

Demand Planning

• Type of forecast
• Major planning considerations
  — Acquisition objectives
  — Items due
  — Replacement factor
  — Density, etc.
Demand Planning, cont.

• Secondary item planning considerations
  – Historical demand
  – Serviceable returns
  – Change factors – environmental characteristics

Scheduling

• Use of Master Production Schedule (MPS)
• Use project management – work breakdown structure/budget
Pre-Shop Analysis (PSA)

- Unique to remanufacturing
- Mandatory
  - Edit routings for unplanned activities
  - Record QA defects and scrap
  - Identify material procurement actions
  - Identify additional repair parts

Inventory

- REMAN more complex
  - Inventory movements – repair, WIP clarification, etc.
  - Changing inventory status/condition
  - Definitions
    1. Transfer Order (TO) – move material from one storage location to another
    2. Transfer Posting (TP) – Changes in stock type – same, location
Inventory, cont.

• More transactions – important to do – bracket/motor

Bills of Material

• Quantity issues – not one for one – climate issues
• Use both quantitative and qualitative forecasting
  — Past history
  — Review new contract for various use changes
• Change ratio if required
• Ongoing revision process
Routings

• Complex
• Use alternate routings. Why?
  – If replaced
  – If refurbished
  – If just cleaned and tested
• Also standards, wait, move, queue, and set-up times dependent on above

Finance

• Accurate costs important
• REMAN issues
  – Make or buy
  – Recover scrap price
  – Rework costs
  – Very complex for assemblies and subassemblies
Finance, cont.

• Contract budgets
  – Unexpected requirements
  – Unexpected cost
  – Over-runs and under-runs
• Process costs

Accurate Transaction Reporting

• Cornerstone of a successful system
• Examples of transaction reporting
  – Past-due production orders
  – Reporting orders have started
  – Reporting orders completed – confirmations
  – No unplanned issues – means right parts issued
  – Receiving and transferring material
Metrics

• Total inventory value
• Obsolete and slow-moving inventory
• Inventory turns
• Completed cycle counts
• Number of inventory errors
• Work center past-due production orders

Metrics, cont.

• Work center performance to schedule based on start date
• Work center performance to schedule based on finished date
• Confirmations scheduled
• Exception messages
• Unplanned issues report
**Metrics, cont.**

- Rough-cut capacity planning
- BOM accuracy
- Routing accuracy
- Others that can be added are:
  - Missing parts report
  - Review of aged purchase orders, etc.

**Important Metrics**

- Measuring the right metrics is the foundation of any successful ERP system implementation. These are considered the cornerstones. The four cornerstones of a successful ERP system are:
  - Accurate inventory
  - Accurate shop floor activities reporting
  - Accurate BOMs
  - Accurate routings
Completed Cycle Counts (ASRS Inventory Accuracy)

<table>
<thead>
<tr>
<th>Quarter Ending</th>
<th>Goal</th>
<th>Actual Month End</th>
</tr>
</thead>
<tbody>
<tr>
<td>*September 2011</td>
<td>60%</td>
<td>42.23%</td>
</tr>
<tr>
<td>December 2011</td>
<td>70%</td>
<td>72.9%</td>
</tr>
<tr>
<td>March 2012</td>
<td>80%</td>
<td>91.3%</td>
</tr>
<tr>
<td>June 2012</td>
<td>95%</td>
<td>90.3%</td>
</tr>
<tr>
<td>September 2012</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Baseline

Completed Cycle Counts (ASRS Inventory Accuracy)

Measured as a percentage

- Sept-11: 42
- Oct-11: 61
- Nov-11: 75.7
- Dec-11: 72.9
- Jan-12: 83.1
- Feb-12: 60
- Mar-12: 60.5
- Apr-12: 70
- May-12: 91.3
- Jun-12: 86.7

Goal
Actual
## Confirmations Scheduled

- This measurement is based on total scheduled order confirmations to be executed versus total orders confirmed. Only released production orders are used in calculations.

<table>
<thead>
<tr>
<th>Quarter Ending</th>
<th>Goal</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 2011</td>
<td>53.5%</td>
<td>44.96%</td>
</tr>
<tr>
<td>December 2011</td>
<td>62.4%</td>
<td>55.1%</td>
</tr>
<tr>
<td>March 2012</td>
<td>71.4%</td>
<td>66.4%</td>
</tr>
<tr>
<td>June 2012</td>
<td>80.3%</td>
<td>48.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Classifications</th>
<th>% Confirmed May</th>
<th>% Confirmed June</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>50.1%</td>
<td>48.6%</td>
</tr>
<tr>
<td>Item A</td>
<td>54.4%</td>
<td>66.4%</td>
</tr>
<tr>
<td>Item B</td>
<td>62.2%</td>
<td>75.7%</td>
</tr>
<tr>
<td>Item C</td>
<td>46.2%</td>
<td>70.0%</td>
</tr>
<tr>
<td>Item D</td>
<td>78.5%</td>
<td>25.3%</td>
</tr>
<tr>
<td>No Assigned Work Centers</td>
<td>30.2%</td>
<td>26.45%</td>
</tr>
</tbody>
</table>

### Measured as a percentage

![Graph showing the measured percentage from Sep-11 to Jun-12](image)
Summary

• Definitions:
  – Manufacturing – fabricating or assembling of an end item from many components and materials
  – Remanufacturing – begins with unserviceable asset and repairs that asset into a serviceable condition

Summary, cont.

• Areas of differences discussed:
  – Importance of pilot
  – Disassembly
  – Basic accuracies – BOM, routings, inventory, transactions
  – Lifecycle management
Summary, cont.

• Supply chain planning
  – Demand planning
  – Scheduling
  – Pre-shop analysis
• Inventory
• Bills of Material
• Routings

Summary, cont.

• Financial issues
• Metrics

Must document agreed-upon processes or best practices for all areas.
Summary, cont.

• Case study – last four years
• ERP in remanufacturing environment
• Differences “devil in the details”
• Many challenges (opportunities)
• Discussed differences – manufacturing vs. remanufacturing

Summary, cont.

• Provided some examples
• Just the beginning – follow-up recommended

Many opportunities exist for improvement, and this type of implementation is subject to a continuous improvement approach.