

## ***Business Audit Solves Inventory and Reliability Issues***

**The Challenge:** Excessive spare parts inventory and a reactive maintenance environment were causing cash flow issues at a large Middle Eastern refinery complex. These issues were also impacting asset availability-reliability and needlessly driving up maintenance-repair costs.

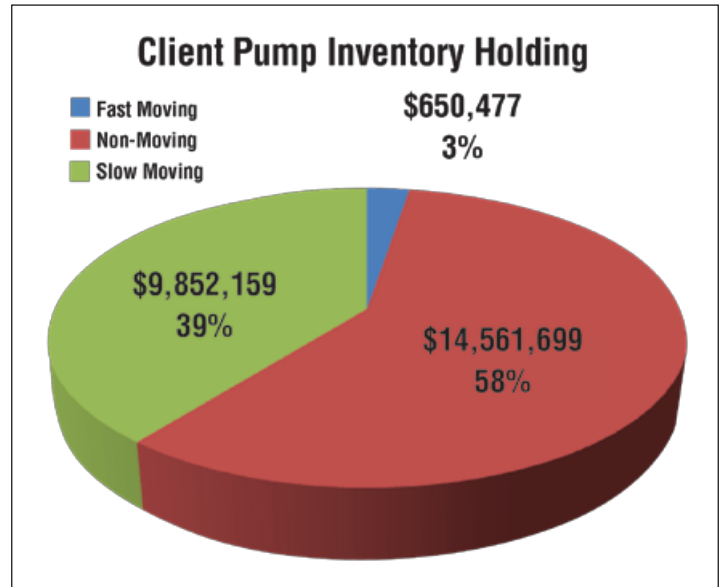
**The Solution:** A detailed business audit focusing on the plant’s inventory found that a surprisingly high percentage of pump bill of material (BOM) data was incorrect. Reconciling this data would not only address inventory management issues but also dramatically reduce time-to-repair (TTR) and rework rates. Combined with further enhancements to planning systems and maintenance procedures, these improvements will drive 10-year cost savings of up to \$23.1 million and a cash flow increase of \$2.4 million annually.

The management of a Middle Eastern refinery with a total pump population of approximately 1,700 units was growing increasingly concerned due to pump reliability issues, decreased asset availability and long repair cycles. They engaged Flowserve to perform a business audit which confirmed inventory-related CAPEX and cash flow restraints along with reduced margins due to asset availability issues.

### ***Preliminary Audit***

A preliminary investigation quantified the problems as follows:

- High carrying costs of approximately \$2.9 million annually due to excessive levels of non-moving pump parts (approximately \$14.5 million) being held in inventory. In an attempt to contain these costs, parts were not ordered to replenish stock until needed.
- Availability issues occurred as pump repairs were delayed awaiting the delivery of both critical and non-critical parts, thus affecting TTR: 128 days for critical pumps and 86 days for non-critical pumps. Approximately 70% of all repairs was accomplished with locally manufactured/fabricated parts.



- A reactive maintenance approach caused by a daily planning system, incorrect criticality assignments, ineffective work order prioritization and an inadequate hand-over processes from field maintenance to the workshop.
- Quick fabricating and reactive maintenance practices resulted in high levels of premature pump failure.

**Audit Findings**

- **Incorrect BOM.** The actual reason for the high inventory was due to incorrect BOMs. During a previous business system conversion a high percentage of BOM data were either lost or reassigned to the incorrect tag number.

When a pump was taken to the workshop, the BOM was either incomplete or incorrect which caused problems when identifying any required parts for repair. The audit validated that approximately \$0.9 million of incorrect parts were issued against pump repairs and then not returned due to an overly complex inventory return procedure. The audit also revealed that approximately \$1.8 million of parts were directly procured for pump repairs when these same parts were available in inventory, but unassigned to the pump BOM and classed as non-moving. This culminated in a high value of non-moving parts that were actually usable, but their requirement was invisible to plant management.

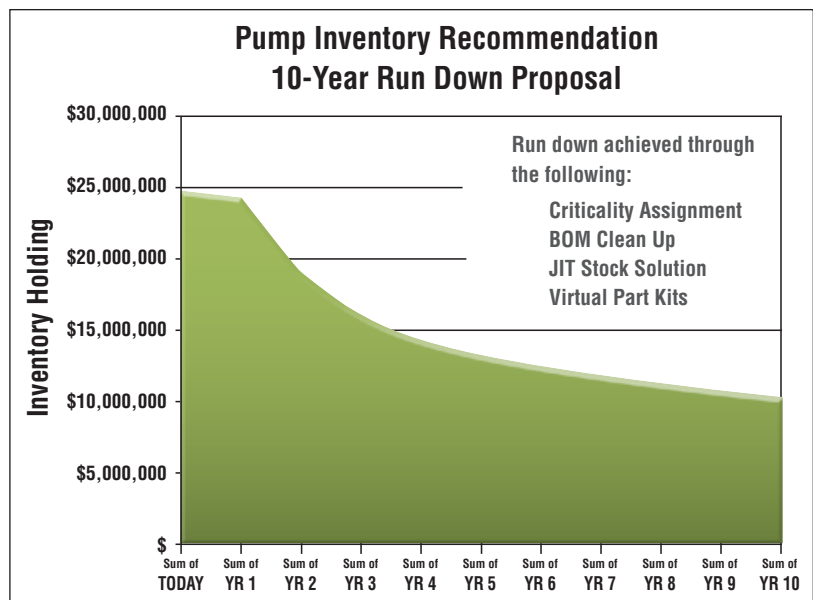
- **Extended TTR.** As parts were either incorrectly assigned in the BOM or not visible to maintenance on 70% of all repairs, pump TTR was significantly delayed due to parts re-order or fabrication. Reactive planning, criticality assignment and hand-over issues were also significant contributing factors to high TTR.
- **Reliability.** The audit revealed that 85% of these premature failures could be traced back to the pumps using non-OEM, locally manufactured parts.

**The Results**

Flowserve helped the plant operator correctly match \$14.4 million of its total \$24.6 million inventory (59% of total) by generating BOMs. Flowserve also recommended:

- Correcting all pump BOMs
- Creating standard virtual pump parts kits
- Implementing just-in-time (JIT) solutions
- Correcting criticality level assignments
- Improving workshop hand-over procedures

The overall payback of implementing the Flowserve inventory and supply chain solutions recommendations would yield a net 10-year cost savings of \$23.1 million and a cash flow benefit of \$2.4 million annually.



Bulletin FSG-SS-010a (E) Printed in USA. July 2010.  
 © Flowserve Corporation

**To find your local Flowserve representative:**

For more information about Flowserve Corporation, visit [www.flowserve.com](http://www.flowserve.com) or call USA 1 800 728 PUMP (7867)

**USA and Canada**

Flowserve Corporation  
 5215 North O'Connor Blvd.  
 Suite 2300  
 Irving, Texas 75039-5421 USA  
 Telephone: 1 937 890 5839

**Europe, Middle East, Africa**

Flowserve Corporation  
 Gebouw Hagepoint  
 Westbroek 39-51  
 4822 ZX Breda  
 Netherlands  
 Telephone: 31 76 502 8920

**Latin America**

Flowserve Corporation  
 Martín Rodriguez 4460  
 B1644CGN-Victoria-San Fernando  
 Buenos Aires, Argentina  
 Telephone: 54 11 4006 8700  
 Telefax: 54 11 4714 1610

**Asia Pacific**

Flowserve Pte. Ltd.  
 10 Tuas Loop  
 Singapore 637345  
 Telephone: 65 6771 0600  
 Telefax: 65 6779 4607

## ***Business Audit Solves Inventory and Reliability Issues***

**The Challenge:** Excessive spare parts inventory and a reactive maintenance environment were causing cash flow issues at a large Middle Eastern refinery complex. These issues were also impacting asset availability-reliability and needlessly driving up maintenance-repair costs.

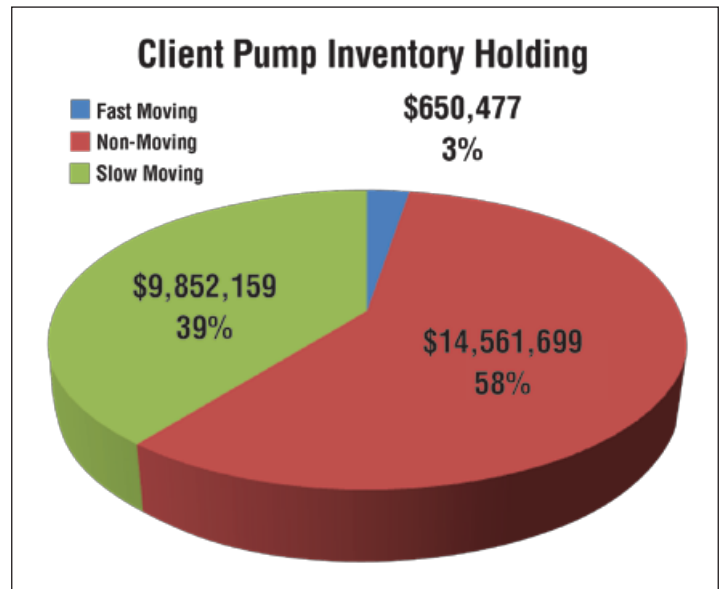
**The Solution:** A detailed business audit focusing on the plant’s inventory found that a surprisingly high percentage of pump bill of material (BOM) data was incorrect. Reconciling this data would not only address inventory management issues but also dramatically reduce time-to-repair (TTR) and rework rates. Combined with further enhancements to planning systems and maintenance procedures, these improvements will drive 10-year cost savings of up to \$23.1 million and a cash flow increase of \$2.4 million annually.

The management of a Middle Eastern refinery with a total pump population of approximately 1,700 units was growing increasingly concerned due to pump reliability issues, decreased asset availability and long repair cycles. They engaged Flowserve to perform a business audit which confirmed inventory-related CAPEX and cash flow restraints along with reduced margins due to asset availability issues.

### ***Preliminary Audit***

A preliminary investigation quantified the problems as follows:

- High carrying costs of approximately \$2.9 million annually due to excessive levels of non-moving pump parts (approximately \$14.5 million) being held in inventory. In an attempt to contain these costs, parts were not ordered to replenish stock until needed.
- Availability issues occurred as pump repairs were delayed awaiting the delivery of both critical and non-critical parts, thus affecting TTR: 128 days for critical pumps and 86 days for non-critical pumps. Approximately 70% of all repairs was accomplished with locally manufactured/fabricated parts.



- A reactive maintenance approach caused by a daily planning system, incorrect criticality assignments, ineffective work order prioritization and an inadequate hand-over processes from field maintenance to the workshop.
- Quick fabricating and reactive maintenance practices resulted in high levels of premature pump failure.

**Audit Findings**

• **Incorrect BOM.** The actual reason for the high inventory was due to incorrect BOMs. During a previous business system conversion a high percentage of BOM data were either lost or reassigned to the incorrect tag number.

When a pump was taken to the workshop, the BOM was either incomplete or incorrect which caused problems when identifying any required parts for repair. The audit validated that approximately \$0.9 million of incorrect parts were issued against pump repairs and then not returned due to an overly complex inventory return procedure. The audit also revealed that approximately \$1.8 million of parts were directly procured for pump repairs when these same parts were available in inventory, but unassigned to the pump BOM and classed as non-moving. This culminated in a high value of non-moving parts that were actually usable, but their requirement was invisible to plant management.

• **Extended TTR.** As parts were either incorrectly assigned in the BOM or not visible to maintenance on 70% of all repairs, pump TTR was significantly delayed due to parts re-order or fabrication. Reactive planning, criticality assignment and hand-over issues were also significant contributing factors to high TTR.

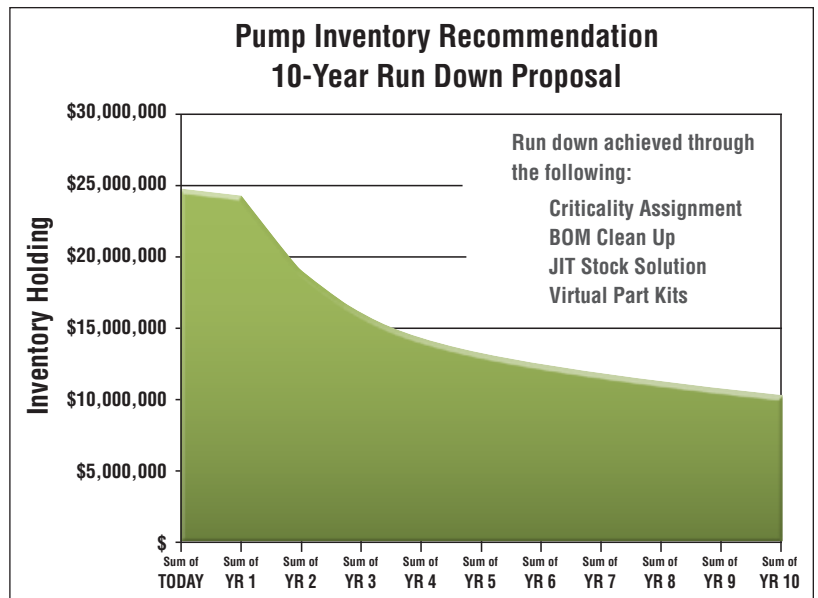
• **Reliability.** The audit revealed that 85% of these premature failures could be traced back to the pumps using non-OEM, locally manufactured parts.

**The Results**

Flowserve helped the plant operator correctly match \$14.4 million of its total \$24.6 million inventory (59% of total) by generating BOMs. Flowserve also recommended:

- Correcting all pump BOMs
- Creating standard virtual pump parts kits
- Implementing just-in-time (JIT) solutions
- Correcting criticality level assignments
- Improving workshop hand-over procedures

The overall payback of implementing the Flowserve inventory and supply chain solutions recommendations would yield a net 10-year cost savings of \$23.1 million and a cash flow benefit of \$2.4 million annually.



**To find your local Flowserve representative:**

For more information about Flowserve Corporation, visit [www.flowserve.com](http://www.flowserve.com) or call USA 1 800 728 PUMP (7867)

**USA and Canada**

Flowserve Corporation  
 5215 North O'Connor Blvd.  
 Suite 2300  
 Irving, Texas 75039-5421 USA  
 Telephone: 1 937 890 5839

**Europe, Middle East, Africa**

Flowserve Corporation  
 Gebouw Hagepoint  
 Westbroek 39-51  
 4822 ZX Breda  
 Netherlands  
 Telephone: 31 76 502 8920

**Latin America**

Flowserve Corporation  
 Martín Rodríguez 4460  
 B1644CGN-Victoria-San Fernando  
 Buenos Aires, Argentina  
 Telephone: 54 11 4006 8700  
 Telefax: 54 11 4714 1610

**Asia Pacific**

Flowserve Pte. Ltd.  
 10 Tuas Loop  
 Singapore 637345  
 Telephone: 65 6771 0600  
 Telefax: 65 6779 4607