PRODUCTOS TUBULARES – DBR IMPLEMENTATION

Who We Are and What We Do

PRODUCTOS TUBULARES (PT), owned by holding GRUPO TUBOS REUNIDOS (TR), is a manufacturer of Hot Finished Seamless Steel Pipes and Tubes.

Located near Bilbao seaport
2015 in numbers for Productos Tubulaires

- Turnover was $114 million US Dollars
- EBITDA of $4.55 million
- Production reached 47,155 tons of steel pipes
- Sold in 70 different countries around the world.

We are an **Integral Manufacturer of Seamless Steel Pipes**

- Outside Diameter from 190 mm to 635 mm (7 1/2 - 25")
- Walls up to 125 mm (5")
Before the World Economic Crisis (2007) steel pipe market was flooded with demand and manufacturers.

- Standard products.
- Processing large batches.
- Purchased by intermediaries. Stock positioned close to end of the supply chain.

By the end of 2008, this scenario vanished.

- Intermediaries got rid of their inventory and became more concerned about service level.
- Construction companies of hydraulically fractured oil & gas wells became a more important customer.
- Customized products.

Was it possible for Manufacturers to compete in this New Scenario with the same vision, business rules and technology that led to great results in the past?

When – Who – What – How

**When?** In November 2014, PRODUCTOS TUBULARES Board took the decision of implementing DBR concepts to improve the Operations Supply Chain.

**Who?** The Managing Director assigned this project leadership to PT´s Production Manager, who contacted CMG Consultores to develop a solution.

**What?** The GOAL of the project was:

*To improve the flow of materials and information to deliver a better service level.*

**How?** DBR rules and tools were implemented in three key areas, Planning, Execution and Control.
Old Policy 1: Rolled Tons (Ton/Month) is the main productivity metric.

Associated Behaviors

• Increase “rolling loads” per Matrix Diameter.
• Customer Orders rolled ahead of time to Optimize setups and batch sizes
• Pipes with low finishing work load are pushed to production ahead of time.
• Delay smaller diameters as much as possible

Negative Effects

• WIP Inventory increases.
• Temporary bottlenecks in finishing resources.
• It seems finishing resources capacity is scarce
• Low Customer Service Levels.

Old Policy 2: Monthly customer due date batching

Associated Behaviors

• Monthly batching rolling loads
• End-of-Month syndrome: all work orders are expedited too late
• Delays of 1 month or multiple

Negative Effects

• WIP Inventory increases.
• It becomes very difficult to prioritize orders.
• Low Customer Service Levels.
New Policy 1: The main productivity metric should be monthly cashflow.

**Associated Behaviors**

- KPI: On time Orders in items and euros.
- Delays are measured in Gross Margin Euros that cannot be invoiced on time.
- Objective criteria to prioritize orders.
- Rolled Tons metric is ERRADICATED- Invoiced /Shipped TONS, new main metric.

**Associated Effects**

- The whole system is subordinated to customer’s demand: Service Level improve.
A- Each Matrix has to enter production more frequently

**Goal**

Increase the rolling frequency of each pipe type to stagger the work load for the resources downstream.

B- A Uniform work load for each critical resource downstream has to be delivered from Rolling, according to the order book

**Goal**

Delay o bring forward work orders’ start dates only for those pipes that allow critical resource work load to be staggered and avoid flow obstructions.

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**New Policy 2 : Minimum of 5 rolling loads per week to improve flow.**

**Associated Behaviors**

- Rolling Plan has to consider downstream critical resource load: Heat Treatments, Grindings, Straightening.
- Rolling Plan must assure a minimum work load for critical resources.
- Orders can only be pushed to production ahead of time to achieve the minimum work load for the critical resources.

**Associated Effects**

- Material input plan is stable.
- No artificial bottlenecks are generated downstream
- Hidden capacity emerges
- WIP inventory reduced
- Less overtime hours are required in downstream resources
New Policy 3: Daily due dates for managing shop floor priorities.

Associated Behaviors

- Weekly batching in Rolling Plan, instead of monthly batches.
- Lead times are managed according to 6 different product families.
- A Shipping Buffer is assigned to Each Rolling Order to obtain and End-of-Production due date.

Associated Effects

- WIP inventory reduced
- Customer Service Level increases
- It becomes easier to prioritize between orders.
- Material moves faster and in a more organized manner.

New Policy 4: Due Dates are tracked thru Shipping Buffers.

Associated Behaviors

- The Rolling Plan is synchronized taking to account each pipe Shipping Buffer.
- Resource production schedules execution is controlled by managing priorities in critical resources according to Shipping Buffer Status.

Associated Effects

- Less data, more information
- Less schedule modifications.
- Stable execution priorities.
- Early warnings if due dates are in risk.
Prioritization, Preparation & Location of RED PIPES is Key for FLOW

Prioritization System: Buffer Consumption

\[
\% \text{Buffer Cons.} = \left( \frac{\text{Today} - \text{Rolling Date}}{\text{End of Prod Date} - \text{Rolling Date}} \right) \times 100
\]

A - Planning Criteria-Downstream Critical Resource Pipe %

B - Rolling due date delay
C - Daily Production Control

D - Critical Resource Queue Trend.

F - Service Level
One of the most important challenges in terms of Execution Control was the lack of technology applied to internal flow.

An Android APP for tablets was developed by PT IT Department for better flow control.

ERP was also modified to generate daily priority list for each resource.
It is possible to estimate the End of Production Date. Adding total queue days ahead of the critical resources in the items route.

*We can estimated a real delivery date*
- Good Customer information
- Less Sales Dpmt. noise

<table>
<thead>
<tr>
<th>PurchaseOrder</th>
<th>PIPE CODE</th>
<th>Week Delivery</th>
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</thead>
<tbody>
<tr>
<td>681 171 167 1</td>
<td>9708</td>
<td>6 2</td>
</tr>
<tr>
<td></td>
<td>9709</td>
<td>11 2 2</td>
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<tr>
<td></td>
<td>9710</td>
<td>4 4</td>
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DBR policies Go Live date was January 2015, achieving results before the end of Q1 2015

**Work In Process reduction**
- Rolling stopped for 1 week in March 2015
- After that the WIP remained stable with a 30% inventory reduction

**Lead Time reduction**
- Dramatically reduced after DBR policies.
- Dropping from 35 to 14 days on average.
Customer Service Level

% of full orders shipped on time to the customer

- Before DBR implementation CLS oscillated between 30-50%.
- After ONLY 3 MONTHS of planning, executing and controlling according DBR policies, 80%+ was achieved.
**ECONOMIC conclusion**

- PT Top Management was very concerned about the impact inventory reduction would have in the balance sheet.

- However, Turnover improved (+60%) with less Rolled Tons (-7%) and just a slight increase in Finished Tons (+8%).

<table>
<thead>
<tr>
<th></th>
<th>Q4 2014</th>
<th>Q1 2015</th>
<th>Q2 2015</th>
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</thead>
<tbody>
<tr>
<td>Rolled Tons</td>
<td>20,175</td>
<td>18,685</td>
<td>18,865</td>
</tr>
<tr>
<td>Finished Tons</td>
<td>13,832</td>
<td>14,905</td>
<td>14,412</td>
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<tr>
<td>WIP variation</td>
<td>1,115</td>
<td>-2,090</td>
<td>-883</td>
</tr>
<tr>
<td>Total Stock Variation (€)</td>
<td>6,100 €</td>
<td>-7,100 €</td>
<td>-5,351,000 €</td>
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<tr>
<td>Turnover (€)</td>
<td>21,715,000 €</td>
<td>35,027,000 €</td>
<td>27,400,000 €</td>
</tr>
</tbody>
</table>

*The right Customer Orders were being manufactured to be shipped and invoiced on time, increasing the Turnover and improving the balance sheet despite the inventory reduction.*
Thank you!