Habot Oil

Streamlining Production and Inventory Planning

Habot Oil manufactures **synthetic lubricants** for the **automotive** and **industrial markets.** These lubricants are manufactured by blending **Base Oils** and **chemical additives** to create a finished lubricant.
Finished Lubricants are packaged in either **1000L IBC's**, **210L Drums**, **20L pails** or **5L** and **1L containers**

The Problem

Raw materials and **finished goods** inventory levels are either **too high or low**. Coupled with a **lack of demand planning processes**, **production planning** and **inventory management** becomes a challenge.

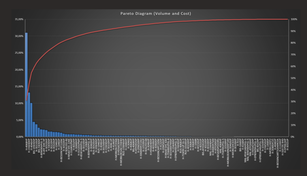
Aim

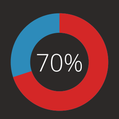
1. **Forecast** Customer Demand
2. Develop a means of **production planning**
3. Balance **Inventory levels** to **meet demand** and **minimise operational costs**

Data Analysis

- **MS Access** Database used to capture **historical demand** and **operational costs**
- **13 Products** identified using **ABC analysis** as most valuable products, **70%** cumulative production costs

BIS-10W40SP
BIS-5W40SP
H-1046UP
H-15W40HP
H-30220HP
H-30220UP
H-30320HP
H-30320UP
H-4046HP
H-4068HP
H-5W40SP
H-80W90HPGL-5
H-ATF DXII HP





Cumulative production costs

Approach

1. Inventory Classification
2. Demand Forecasting
3. Production Planning
4. Inventory Planning

Solution

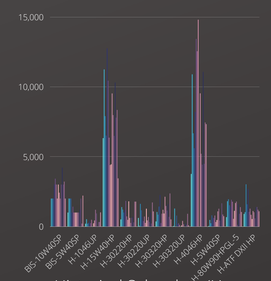
Demand Forecasting

Historical sales data was used in conjunction with 3 time series forecasting approaches:

- **Moving Average**
- **Exponential Smoothing**
- **Regression with trend**

The forecast method that yielded the lowest forecasting error for each product was used to forecast its demand. Forecast accuracy was computed using the Mean Absolute Deviation (**MAD**)

MAD = |Actual Sales - Foreeasted Demand|



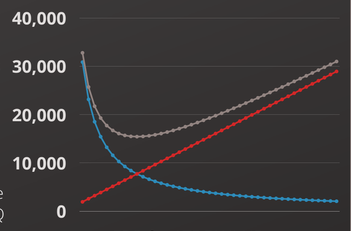
Historical Sales data (L)

Production Planning

In order to determine an optimal batch size volume to blend for a given product, an **Economical Production Quantity** was obtained for each product. The core inputs into the model included:

- **Annual forecasted demand**
- **Production costs**
- **Production rate = 4000L/day-product**

A **Master Production Schedule** was drawn up, where the economic lot size for any production run is equal to its EPQ



EPQ for ATF DX II-HP

Inventory Management

Raw material inventory requirements directly relate to the net requirements of the product it is a component of. **Habot sells products on a volume basis**, whereas **raw materials are obtained on a mass basis in kilograms**. To bridge the gap, the **Bill of Materials** incorporates product **densities** to determine the net requirements of each raw material required. In order to determine the optimal order quantity of each raw material, an **Economic Quantity Model** was developed for each raw material.

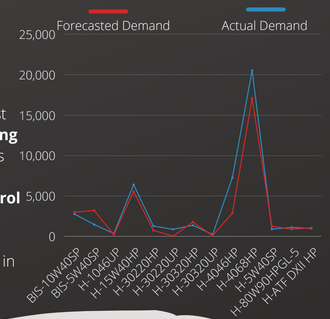
	H-4068HP		Weight(kg): 14663,13
Demand in Litres	17070	Density:	0,859
Raw Material	**Fraction Weight**		**Mass Requirements (kg)**
Base Oil 1	0,71		10410,822
Base Oil 2	0,2814		4126,205
Additive 1	0,0066		96,777
Additive 2	0,0022		32,259

BOM used to consolidate volume requirements into mass requirements

Results

Forecasting

The forecasting model was verified against actual sales in September 2021. A **Tracking Signal** was used to verify whether there is any **forecast bias** present. The current forecast system was shown to be **in control** for the month of **September 2021**. The associated graph highlights **forecasted sales** vs **actual sales**. Minor fluctuations in demand are addressed through the MPS.

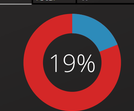


Cost Savings

Using the MPS and EPQ blend volumes, the model was compared to actual production data in **September 2021**. The associated table highlights the **difference** between what Habot **produced** for the month of September 2021 and the **production planning model outputs**. The following can be summarized as the results of the model:

- Customer **demand satisfied** in September 2021
- Ending I**nventory levels economically minimized**
- Total **Production costs reduced by 19%** for September 2021

Product	Difference	Cost/L	Ammount saved in production costs
BIS-10W40SP	416	R 48,87	R 20 329,92
BIS-5W40SP	1574	R 50,45	79408,3
H-1046UP	1226	R 81,08	99404,08
H-15W40HP	2075	R 21,07	43720,25
H-30220HP	500	R 48,07	24035
H-30220UP	1059	R 178,67	188496,85
H-30320HP	454	R 25,11	11399,94
H-30320UP	508	R 64,93	32984,44
H-4046HP	1100	R 10,52	11572
H-4068HP	0	R 74,07	0
H-5W40SP	647	R 24,82	16058,54
H-80W90HPGL-5	-385	R 41,44	-15954,4
H-ATF DXII HP	905	R 0,17	153,85
		Total	R 511 608,77



reduction in production costs

IE Tools

- **ABC Analysis**
- **Time series forecasting**
- **Economic Production Quantity**
- **Economic Order Quantity**
- **Master Production Scheduling**

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