

MANUFACTURING SALES & OPERATIONS PLANNING



**AN IBM COGNOS
PERFORMANCE BLUEPRINT
APPLICATION BRIEF**

**A WEB-BASED PERFORMANCE
MANAGEMENT APPLICATION**

INTRODUCTION

Manufacturing Sales & Operations Planning (S&OP) has captured much attention as a result of the globalization and the dual requirements of meeting customer demand and providing optimal operational efficiencies. Traditionally, the marketing, sales, and manufacturing groups within an organization have operated in “silos” with different goals, which may threaten overall enterprise objectives. But increasingly, companies are recognizing the need for a robust S&OP model that allows the various groups to jointly address operational issues affecting overall corporate goals.

Basic to an S&OP application are:

- The requirement for an integrated model which gives all groups within the company both visibility and the ability to respond to one another.
- The requirement for quick response and delivery to customers and distributors in order to remain competitive.
- The requirement to quickly incorporate and plan for new products, so that ever-increasing demand for the “latest and greatest” can be met.
- The ability to plan and distribute manufacturing operations in the most cost- and time-efficient manner.
- The ability to plan for third-party—such as off-shore or contractor—sourcing.



BLUEPRINT OBJECTIVE

The *IBM Cognos Sales & Operations Planning Blueprint* offers an integrated performance management model that allows companies to effectively plan sales and operations across manufacturing plants. Both top-down and bottom-up planning are enabled. The *Blueprint* ensures that plans align with corporate goals and enables information-sharing and more efficient analysis among the various groups.

Key IBM Cognos 8 Planning Benefits

- Flexible model development to support a wide variety of planning models.
- Web- or Excel-based deployment of models for data collection and consolidation.
- Easy version control.
- Real-time workflow to enhance collaboration.
- Real-time consolidation.
- Real-time reporting.
- Real-time browser-based calculation to provide immediate results.
- Audit and user text annotations at cell, worksheet, and model levels to further improve collaboration.
- Drop-down validation lists to ensure data consistency.
- Scalable architecture with proven deployments to thousands of users.
- Linking functionality to provide divergent, yet interrelated components of planning environment.
- Off-line capabilities.
- Custom dating capabilities with no limit on time dimensions, allowing planning by the week, season, period, quarter, or year.
- Unique multi-directional calculation engine allows input across any dimension at detail or total levels.

OVERVIEW

Production planning is often the primary focus of a manufacturer's profit-and-loss statement. Forward-looking collaboration must occur so that sales demand can be profitably supported by production capacity.

The *IBM Cognos Sales & Operations Blueprint* allows manufacturers to deploy demand planning to the appropriate level in the field sales organization (sales managers, manufacturers' representatives, salespersons, or externally to customers) to plan anticipated demand for a region or selected channel. An easily updated model gives plant managers and production planners the capability to manage production and meet anticipated demand levels. In this model, we assume that production will align with geographic demand.

The *Blueprint* focuses on a golf equipment manufacturer whose plants are assigned one or more product lines. For example, the Moline plant may produce both golf clubs and golf balls. It is realistic to also assume that different plants manufacture the same product or product line and that production allocation decisions are based, not only on capacity, but also on other factors, such as geography or plant production costs.

The *IBM Cognos Sales and Operations Blueprint* calculates production costs by product by plant, so that the decision on where to produce can be based on the most efficient model and assumptions. It also allows for the fact that, in some situations, it may be

more cost-efficient to outsource production. In many companies, certain product lines are manufactured solely by contractors. This is also true in our example, where it is assumed that clothing is outsourced.

The starting point for the *Blueprint* is the Customer Demand application, which focuses on demand forecasting and pricing. The field sales organization will see a current-year baseline forecast together with prior year's forecast by product. They make adjustments to this forecast based on their intimate knowledge of the market. Corporate provides an overall pricing and promotions plan. Regional sales managers can also plan their own promotions. Once these are input, the demand forecast is completed and ready for submission and approval.

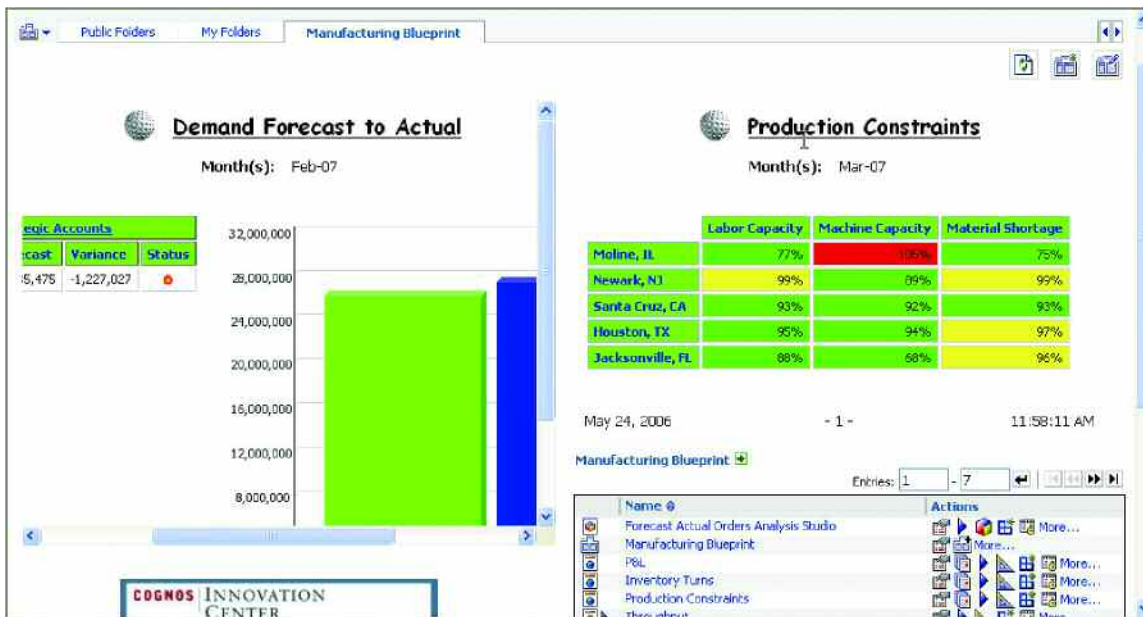
When the demand forecast has been submitted, it is linked to the Operations application. The Operations application requires very little manual input from manufacturing plant managers. Most of the production factors such as labor, machine capacity, and material requirements will be linked in from an ERP system. The percentage of production allocated to specific plants will be decided upon and input by a master planner through centrally controlled assumptions. Based on this determination, the production capacities required to meet plant demand will be output. It is anticipated that multiple iterations of this plan can be performed by the master planner to accommodate expected customer demand and correctly determine production across plants.

REPRESENTATIVE WORKFLOW

The following sections of this application brief describe the basic workflows in which a sales or manufacturing plant manager might participate during the planning process.

After Cognos Information Portal sign-on, the first screen displayed is a dashboard, which provides significant information.

1. The upper left shows a graphical representation of actual and forecast sales demand for the current month.
2. To the right is a “heat map” providing immediate alerts to operational constraints on production facilities.
3. An area at the bottom shows other key reports as well as links to customer demand and operational planning models.






Clicking on this graphic reveals more detail about specific customers and products. You can see, for example, that actual sales for both men's and women's apparel is lower than was forecast.



The heat map on the right identifies the nature and location of any operational constraints. Here, the Moline plant is unable to support its allotted production due to machine constraints. By allocating some production to Newark, demand can still be met.

REAL-TIME WORKFLOW VISIBILITY

The master planner has real-time, company-wide visibility—either as a “parent” or reviewer—to the workflow status of each plant. As workflow status changes, data consolidation and aggregation occur in real-time—without batch processing—driving down the time needed to perform the planning iteration.

Before data is entered, the plan is  **Not started**. Once saved, it becomes a  **Work in Progress** and remains accessible for editing. When ready for review and submitted, the plan is  **Locked** and no more changes can be made. A reviewer can review the plan in any state, but can only reject a locked item. When rejected, it is again a work in progress.



The screenshot shows the Cognos Planning - Contributor interface. The main content area displays a table titled "You are a contributor for:" with the following data:

Name	State	Ownership	Reviewer	Last Data Change
(All)		Email All		
Moline, IL	 Work In Progress	Administrator	Administrator	8:12:09 AM - May 05, 2006
Newark, NJ	 Not Started	Administrator	Administrator	6:23:02 PM - May 04, 2006
Santa Cruz, CA	 Work In Progress	None	Administrator	6:22:01 PM - May 04, 2006
Houston, TX	 Not Started	None	Administrator	6:20:40 PM - May 04, 2006
Jacksonville, FL	 Not Started	None	Administrator	6:19:39 PM - May 04, 2006
Master Planning	 Work In Progress	Administrator	Administrator	6:18:55 PM - May 04, 2006

The interface also includes a left-hand navigation pane with "Contributions" and "Reviews" sections, and a top navigation bar with "Administrator" and "User Instructions About Help" links.

REPRESENTATIVE WORKFLOW

The *IBM Cognos Sales & Operations Performance Blueprint* is designed to be used collaboratively by sales, marketing, master planning/scheduling, and plant managers to enable sales demand to be met by manufacturing plants. The *Blueprint* provides a real-time view of the plants' capacities to meet forecast demand. It allows all groups to plan with the goal of achieving overall company targets.

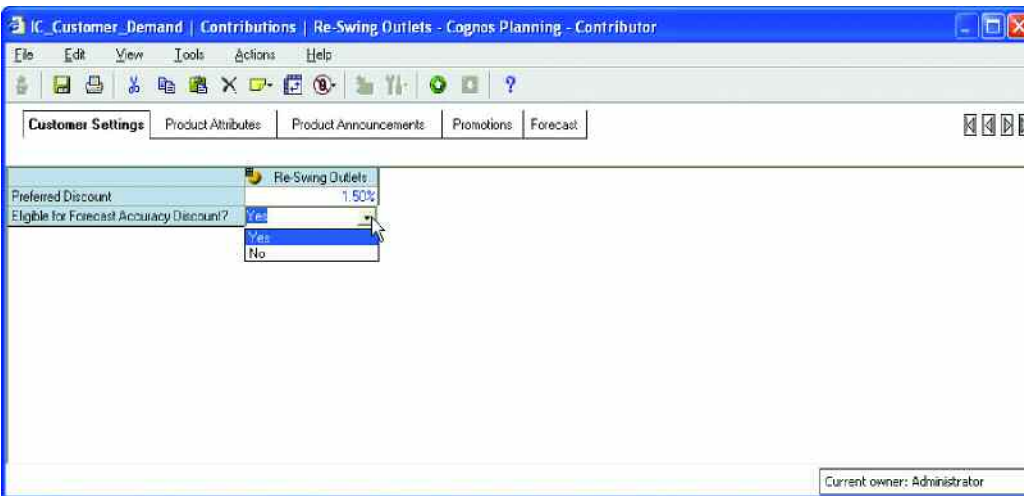
The following sections of this document describe the basic workflows in which:

- Field sales organization inputs demand forecast and promotions by product.
- Master planner links and loads sales demand by product from the customer demand model.
- Demand is adjusted by the master planner and allocated among plants.
- Plant managers can link to the master plan to view allocated plant demand.
- Plant managers determine capacity to meet volume demand by adjusting labor, material, and machine assumptions.
- Master planner views all plant capacities and as necessary reallocates demand among the plants or out-sources to contractors.

FIELD SALES ORGANIZATION VIEW

Customer Settings

This tab is used to input customers' Preferred Discount amount and eligibility for a Forecast Accuracy Discount, which rewards key customers and distributors if they provide accurate demand to the manufacturing organization. A sales associate inputs the discount percentage and simply selects *Yes* or *No* from the drop-down. No input is necessary if there is no customer or applicable forecast accuracy discount.



Product Attributes

This tab contains the corporate List Price, anticipated Price Increases, Minimum Order, and Volume Discounts by product. The tab is provided for informational purposes and to display assumptions used in other tabs. No input is required.

The screenshot shows a software window with a menu bar (File, Edit, View, Tools, Actions, Help) and a toolbar. Below the toolbar are tabs: Customer Settings, Product Attributes (selected), Product Announcements, Promotions, and Forecast. The main area displays a table for 'Clubhouse Direct Inc' with columns: List Price, Price Increase, Date Increase, New List Price, Minimum Order, Qty to receive Volume Discount, and Volume Discount. The current owner is Administrator.

	List Price	Price Increase	Date Increase	New List Price	Minimum Order	Qty to receive Volume Discount	Volume Discount
DM200 Driver	125.00			125.00	500		
DM210 Driver	150.00			150.00	500		
DM220 Driver	175.00	2.50%	Mar-07	179.38	500	15,000	2.00%
DM230 Driver	185.00	5.00%	Apr-07	194.25	500		
DW100 Driver	105.00	2.50%	Apr-07	107.63	500	10,000	2.00%
DW150 Driver	140.00			140.00	500		
DW160 Driver	150.00			150.00	500		
DW170 Driver	160.00			160.00	500		
DW180 Driver	165.00			165.00	500		
DY120 Driver	100.00			100.00	500		
DY220 Driver	120.00			120.00	500		
IM200 Irons	200.00			200.00	500		
IM220 Irons	220.00			220.00	500		
IM280 Irons	245.00	3.00%	Jun-07	252.35	500		

Product Announcements

No input required. The tab displays company-wide assumptions regarding new products, existing product phase-outs, and obsolescence. If a product will become obsolete, the tab shows its available replacement.

	New Product/Phase Out	Release/Obsolete Month	Special Discount	Special Disc Duration	Like Product
DM200 Driver	Phase Out	Apr-07	20.00%	3 months	DM220 Driver
DM210 Driver					
DM220 Driver					
DM230 Driver	New Product	Apr-07	10.00%	2 months	
DW100 Driver					
DW150 Driver					
DW160 Driver					
DW170 Driver					
DW180 Driver					
DY120 Driver					
DY220 Driver					
IM200 Irons					
IM220 Irons					
IM230 Irons					
IM300 Irons					
IM380 Irons					
IW300 Irons					
IW340 Irons					
HM400 Hybrid					
HM430 Hybrid					
HM500 Hybrid					
HW200 Hybrid					

Promotions

This tab is used to detail specific planned promotions. It allows sales managers to input ten different promotions at the product detail level and specify the anticipated % Lift or Unit Lift in demand from these promotions.

	Promotion	Details	Start Month	Promotion Duration	Promotion End	Promotional Discount	Promotion Price	Lift in %	Lift in Units	Message
01	Inventory Closeout	push out excess	Feb-07	4 months	May-07	5.0%		1.00%		
02										
03										
04										
05										
06										
07										
08										
09										
10										

Forecast

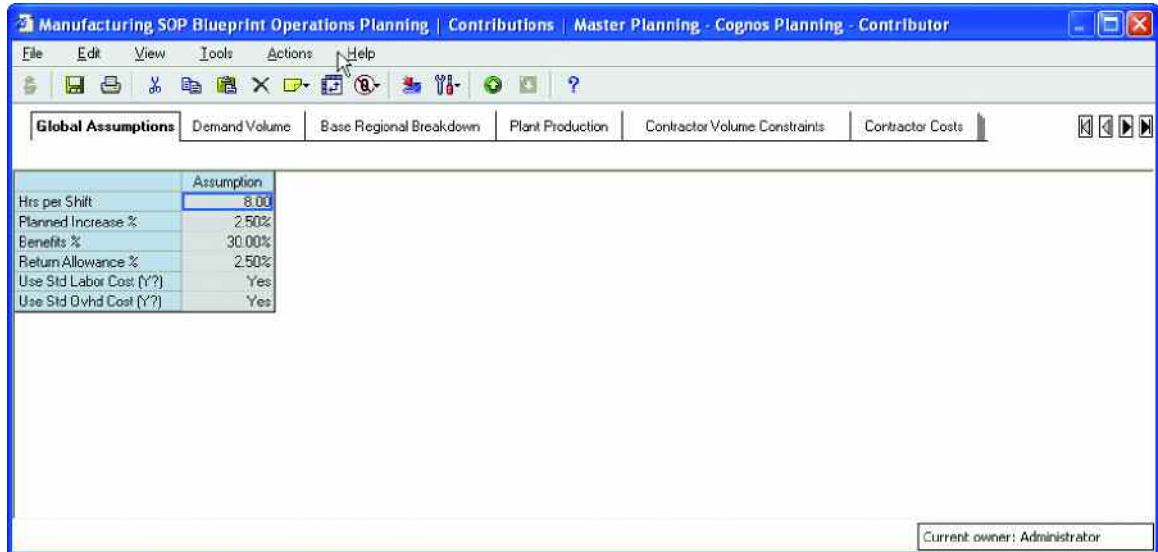
This tab may be used to enter adjustments in Demand to the Base Forecast. These are adjustments in addition to the Promotional “lift” from the Promotions tab. As can be seen in this example, the planner anticipates higher demand for the *DM230 Driver* in April. This type of adjustment is usually based on specific knowledge about customers that was not reflected in the Base Demand. If the product is no longer available, feedback will be given and a similar product is recommended.

	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07
Prior Year Demand	6,850	2,850	1,900	1,900	1,900	2,850	
Base Demand Forecast	7,000	3,000	2,000	2,000	2,000	3,000	
Promotional Lift	0	0	0	0	0	0	
Adj to Demand Forecast	0	0	0	500	0	0	
Revised Demand Forecast	7,000	3,000	2,000	2,500	2,000	3,000	6
Actual Demand Orders	4,900	3,700	3,700	0	0	0	
List Price	\$185.00	\$185.00	\$185.00	\$194.25	\$185.00	\$185.00	\$18
Promotion Price							
Special Product Discount %	0.00%	0.00%	0.00%	10.00%	10.00%	0.00%	0
Preferred Customer Discount %	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	
Volume Discount %	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0
Final Price	\$181.30	\$181.30	\$181.30	\$170.94	\$162.80	\$181.30	\$18
Net Sales	\$1,269,100	\$543,900	\$362,600	\$427,350	\$325,600	\$543,900	\$1,087

MASTER PLANNER VIEW

Global Assumptions

The first tab seen by all users in this model is *Global Assumptions*. It displays corporate assumptions for all planners. Included are drivers as well as costing provisions.



Demand Volume

This tab illustrates the master planner's view derived from the *Forecast* tab in the *Customer Demand* model. It shows product demand both by region and at the aggregated Total Company level. The master planner has "View" rights into the *Customer Demand* application. If the plan is satisfactory to both the sales and operations groups, the master planner can run a real-time link from the *Customer Demand* model to the *Demand Volume* tab in the *Sales & Operations Planning* model. The total company demand by product can now be apportioned across manufacturing plants.

Demand Volume		Base Regional Breakdown	Plant Production	Production Plan	Contractor Volume Constraints	Contractor Costs	Contractors		
Master Planning		Central Region							
		Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07
DM200 Driver	Actual Qty Ordered	19,750	21,600	21,900	1,000	200	0	0	
	Forecast Demand	1,023,008	1,026,000	971,000	843,000	1,121,500	1,586,000	1,360,000	1,530,000
	Master Planner Adjustment	12,000	0	0	0	0	0	0	0
	Total Adjusted Demand	1,021,008	1,026,000	971,000	843,000	1,121,500	1,586,000	1,360,000	1,530,000
DM210 Driver	Actual Qty Ordered	9,700	17,700	18,000	0	0	0	0	0
	Forecast Demand	765,000	425,000	510,000	595,000	595,000	510,000	595,000	595,000
	Master Planner Adjustment	0	0	0	0	0	0	0	0
	Total Adjusted Demand	765,000	425,000	510,000	595,000	595,000	510,000	595,000	595,000
DM220 Driver	Actual Qty Ordered	14,900	14,700	15,300	0	6,000,000	0	0	0
	Forecast Demand	510,000	510,000	1,190,000	510,000	340,000	1,020,000	1,700,000	680,000
	Master Planner Adjustment	0	0	0	0	0	0	0	0
	Total Adjusted Demand	510,000	510,000	1,190,000	510,000	340,000	1,020,000	1,700,000	680,000
DM230 Driver	Actual Qty Ordered	20,200	8,950	9,700	0	0	0	0	0
	Forecast Demand	11,900,000	5,100,000	3,400,000	3,400,000	3,400,000	5,100,000	10,200,000	11,900,000
	Master Planner Adjustment	0	0	0	0	0	0	0	0
	Total Adjusted Demand	11,900,000	5,100,000	3,400,000	3,400,000	3,400,000	5,100,000	10,200,000	11,900,000
DW100 Driver	Actual Qty Ordered	14,500	13,850	14,400	0	0	0	0	0
	Forecast Demand	8,500,000	15,300,000	1,700,000	13,600,000	1,700,000	6,800,000	17,000,000	6,800,000
	Master Planner Adjustment	0	0	0	0	0	0	0	0
	Total Adjusted Demand	8,500,000	15,300,000	1,700,000	13,600,000	1,700,000	6,800,000	17,000,000	6,800,000
DW150 Driver	Actual Qty Ordered	13,300	24,750	24,900	0	0	0	0	0
	Forecast Demand	6,800,000	13,600,000	5,100,000	17,000,000	13,600,000	17,000,000	15,300,000	13,600,000
	Master Planner Adjustment	0	0	0	0	0	0	0	0
	Total Adjusted Demand	6,800,000	13,600,000	5,100,000	17,000,000	13,600,000	17,000,000	15,300,000	13,600,000
DW160 Driver	Actual Qty Ordered	15,500	23,050	23,100	0	0	0	0	0
	Forecast Demand	17,000,000	1,700,000	17,000,000	11,900,000	11,900,000	5,100,000	13,600,000	3,400,000
	Master Planner Adjustment	0	0	0	0	0	0	0	0
	Total Adjusted Demand	17,000,000	1,700,000	17,000,000	11,900,000	11,900,000	5,100,000	13,600,000	3,400,000
DW170 Driver	Actual Qty Ordered	6,700	9,550	10,100	0	0	0	0	0
	Forecast Demand	1,700,000	6,800,000	17,000,000	5,100,000	3,400,000	17,000,000	13,600,000	13,600,000
	Master Planner Adjustment	0	0	0	0	0	0	0	0
	Total Adjusted Demand	1,700,000	6,800,000	17,000,000	5,100,000	3,400,000	17,000,000	13,600,000	13,600,000
DW180 Driver	Actual Qty Ordered	11,500	13,850	14,600	0	0	0	0	0
	Forecast Demand	17,000,000	5,100,000	13,600,000	11,900,000	3,400,000	15,300,000	1,700,000	13,600,000

Current owner: Administrator

Base Regional Breakdown

This tab represents the default regional production allocation. It is based on the correspondence between demand geography and plant geography. The view shows the apportionment of production among plants in the Central Region. This data may be preloaded from historical information.

	% Demand to Plant						All Plants
	Mcine, IL	Newark, NJ	Santa Cruz, CA	Houston, TX	Jacksonville, FL	Contractor	
DM200 Driver	50.00%	50.00%	0.00%	0.00%	0.00%	0.00%	100.00%
DM210 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DM220 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DM230 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DW100 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DW150 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DW160 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DW170 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DW190 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DY120 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
DY220 Driver	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Drivers/Woods	50.00%	50.00%	0.00%	0.00%	0.00%	0.00%	100.00%
IM200 Irons	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Plant Production

This tab enables the master planner to make adjustments to the *Base Regional Breakdown* tab. In the example below, while most plants manufacture golf clubs, while clothing is outsourced, nothing prohibits plants from manufacturing either golf balls or clothing. The master planner may revise the allocation to plants by input to the field “Adj to % to Plant.” It is also possible to adjust this allocation by entering the total percentages in “Revised % to Plant.” These will breakback (allocate) the adjustment percents.

		Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07	Nov-07
Total Demand Volume		1,021,008	1,026,000	971,000	843,000	1,121,500	1,586,000	1,360,000	1,530,000	910,000	970,000	1,190,000
Standard % to Plant	All Plants	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
	Moline, IL	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
	Newark, NJ	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Santa Cruz, CA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Houston, TX	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Jacksonville, FL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Contractor	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Adj to % to Plant	All Plants	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	Moline, IL	0.00%	10.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Newark, NJ	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Santa Cruz, CA	0.00%	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Houston, TX	(25.00)%	(10.00)%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Jacksonville, FL	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Contractor	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Revised % to Plant	All Plants	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Moline, IL	50.00%	60.00%	40.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
	Newark, NJ	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
	Santa Cruz, CA	0.00%	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Houston, TX	(25.00)%	(10.00)%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Jacksonville, FL	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Contractor	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Select Contractor	Contractor											
Plant Volume	Moline, IL	510,504	615,600	388,400	421,500	560,750	793,000	680,000	765,000	455,000	485,000	595,000
	Newark, NJ	510,504	513,000	485,500	421,500	560,750	793,000	680,000	765,000	455,000	485,000	595,000
	Santa Cruz, CA	0	0	97,100	0	0	0	0	0	0	0	0
	Houston, TX	(255,252)	(102,600)	0	0	0	0	0	0	0	0	0
	Jacksonville, FL	255,252	0	0	0	0	0	0	0	0	0	0
	Contractor	0	0	0	0	0	0	0	0	0	0	0
	Weight (hidden)	1,021,008	1,026,000	971,000	843,000	1,121,500	1,586,000	1,360,000	1,530,000	910,000	970,000	1,190,000
	6	6	6	6	6	6	6	6	6	6	6	

Current owner: Administrator

Contractor Volume Constraints

This tab is used to input contractor constraints by product line, which is used to determine capacities.

	Contractor 1	Contractor 2	Contractor 3	Contractor 4	Contractor 5	Total Contractors
Drivers/Woods	0	0	0	0	0	0
Irons	0	0	0	0	0	0
Hybrids	0	0	0	0	0	0
Putters/Wedges	50,000	125,000	100,000	0	25,000	300,000
Golf Balls	500,000	350,000	0	800,000	0	1,650,000
Mens Apparel	100,000	500,000	900,000	0	0	1,500,000
Womens/Youth Apparel	100,000	300,000	900,000	0	0	1,300,000
Total Products	750,000	1,275,000	1,900,000	800,000	25,000	4,750,000

Contractor Costs

This tab represents the average cost per product by contractor. It is assumed that the data from this tab will be linked in from an external source such as Purchasing.

	Contractor 1	Contractor 2	Contractor 3	Contractor 4	Contractor 5
M_Lg Sleeve Pima	\$70.28	\$68.93	\$70.04	\$64.17	\$69.00
M_Lg Sleeve Polo	\$36.70	\$36.86	\$38.57	\$35.34	\$38.00
M_Lg Sleeve Sweat	\$34.63	\$32.98	\$34.51	\$31.62	\$34.00
M_Sht Sleeve Cotton Crew	\$305.09	\$319.13	\$333.93	\$305.97	\$329.00
M_Sht Sleeve Pima	\$65.18	\$62.08	\$64.96	\$59.52	\$64.00
M_Sht Sleeve Polo	\$44.81	\$42.68	\$44.66	\$40.92	\$44.00
M_Sht Sleeve Zipper	\$71.30	\$67.90	\$71.05	\$65.10	\$70.00
M_Touring Jacket	\$118.15	\$112.52	\$117.74	\$107.88	\$116.00
M_Ultra Lite Rain Jacket	\$107.96	\$102.82	\$107.59	\$98.58	\$106.00
M_Ulta Lite Rain Pant	\$76.39	\$72.75	\$76.12	\$69.75	\$75.00
M_V-Neck Sweater	\$90.65	\$85.33	\$90.34	\$82.77	\$89.00
M_V-Neck Vest	\$112.04	\$106.70	\$111.65	\$102.30	\$110.00
M_Waterproof Jacket	\$124.26	\$118.34	\$123.83	\$113.46	\$122.00
M_Waterproof Pant	\$65.18	\$62.08	\$64.96	\$59.52	\$64.00
M_Wind Shirt	\$52.95	\$50.44	\$52.78	\$48.36	\$52.00
W_Lg Sleeve Mock	\$34.63	\$32.98	\$34.51	\$31.62	\$34.00
W_Lg Sleeve Pima	\$60.09	\$57.23	\$59.88	\$54.87	\$59.00
W_Lg Sleeve Polo	\$27.50	\$26.19	\$27.40	\$25.11	\$27.00
W_Lg Sleeve Sweat	\$25.54	\$28.13	\$29.44	\$26.97	\$29.00
W_Sht Sleeve Mock	\$40.74	\$38.80	\$40.60	\$37.20	\$40.00
W_Sht Sleeve Pima	\$53.98	\$51.41	\$53.79	\$49.29	\$53.00
W_Sht Sleeve Polo	\$34.63	\$32.98	\$34.51	\$31.62	\$34.00
W_Ultra Lite Rain Jacket	\$92.68	\$89.27	\$92.37	\$84.63	\$91.00
W_V-Neck Sweater	\$57.04	\$54.32	\$56.84	\$52.08	\$56.00
W_V-Neck Vest	\$41.76	\$39.77	\$41.61	\$38.13	\$41.00
Y_Lg Sleeve Mock	\$35.72	\$37.83	\$39.58	\$36.27	\$39.00
Y_Lg Sleeve Polo	\$52.96	\$50.44	\$52.78	\$48.36	\$52.00
Y_Lg Sleeve Sweat	\$33.61	\$32.01	\$33.49	\$30.69	\$33.00
Y_Sht Sleeve Mock	\$27.50	\$26.19	\$27.40	\$25.11	\$27.00
Y_Sht Sleeve Pima	\$52.96	\$50.44	\$52.78	\$48.36	\$52.00
Y_Sht Sleeve Polo	\$36.70	\$36.86	\$38.57	\$35.34	\$38.00
Y_Ultra Lite Rain Jacket	\$86.57	\$82.45	\$86.28	\$79.05	\$85.00
Y_Ultra Lite Rain Pant	\$65.18	\$62.08	\$64.96	\$59.52	\$64.00
Y_V-Neck Sweater	\$36.70	\$36.86	\$38.57	\$35.34	\$38.00
Y_V-Neck Vest	\$33.61	\$32.01	\$33.49	\$30.69	\$33.00

Current owner: Administrator

Contractors

The tab allows the master planner to view all production by product and contractor.

Demand Volume		Base Regional Breakdown		Plant Production		Contractor Volume Constraints		Contractor Costs		Contractors	
Forecast Contractor Volume		Master Planning									
		Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07
Contractor 1	M_All Weather Jacket	4,590,000	1,020,000	510,000	3,570,000	4,080,000	2,550,000	510,000	2,550,000	3,570,000	1,530,000
	M_Lg Sleeve Chambray	1,530,000	3,060,000	1,020,000	3,570,000	1,530,000	3,060,000	510,000	4,080,000	510,000	510,000
	Mens Apparel	6,120,000	4,080,000	1,530,000	7,140,000	5,610,000	5,610,000	1,020,000	6,630,000	4,080,000	2,040,000
Contractor 2	M_Gore Tex Pant	2,550,000	4,080,000	4,590,000	4,590,000	4,590,000	5,100,000	5,100,000	4,590,000	2,550,000	4,590,000
	Mens Apparel	2,550,000	4,080,000	4,590,000	4,590,000	4,590,000	5,100,000	5,100,000	4,590,000	2,550,000	4,590,000
	Total Products	2,550,000	4,080,000	4,590,000	4,590,000	4,590,000	5,100,000	5,100,000	4,590,000	2,550,000	4,590,000
Contractor 3	M_GoreTex Shirt	510,000	510,000	1,020,000	1,530,000	1,530,000	1,530,000	5,100,000	4,080,000	5,100,000	2,040,000
	Mens Apparel	510,000	510,000	1,020,000	1,530,000	1,530,000	1,530,000	5,100,000	4,080,000	5,100,000	2,040,000
	Total Products	510,000	510,000	1,020,000	1,530,000	1,530,000	1,530,000	5,100,000	4,080,000	5,100,000	2,040,000
Total Contractors	M_All Weather Jacket	4,590,000	1,020,000	510,000	3,570,000	4,080,000	2,550,000	510,000	2,550,000	3,570,000	1,530,000
	M_Gore Tex Pant	2,550,000	4,080,000	4,590,000	4,590,000	4,590,000	5,100,000	5,100,000	4,590,000	2,550,000	4,590,000
	M_GoreTex Shirt	510,000	510,000	1,020,000	1,530,000	1,530,000	1,530,000	5,100,000	4,080,000	5,100,000	2,040,000
	M_Lg Sleeve Chambray	1,530,000	3,060,000	1,020,000	3,570,000	1,530,000	3,060,000	510,000	4,080,000	510,000	510,000
	Mens Apparel	9,180,000	8,670,000	7,140,000	13,260,000	11,730,000	12,240,000	11,220,000	15,300,000	11,730,000	8,670,000
	Total Products	9,180,000	8,670,000	7,140,000	13,260,000	11,730,000	12,240,000	11,220,000	15,300,000	11,730,000	8,670,000

PLANT MANAGER VIEW

The plant manager's view of the model is the same for all manufacturing plants. Each will see only the products or product line(s) specific to that plant. The manager's first task will be to load apportioned product demand from the master planner.

The first tab is *Global Assumptions* (see above).

Product Attributes

The *Product Attributes* tab gives the plant manager a view of current inventory by product as well as metrics for production, yield, standard material cost, target, and historical inventory turnover. Much of this information will be linked from an ERP system. Other data such as target inventory turnover by product may be input.

Product Attributes								
Moline, IL								
	Prior Yr Inventory	Product Category	Produced per Hour	% Yield per Product	Std Material Cost	Target Inventory Turnover	Prior Yr Inventory Turnover	
DM200 Driver	350,000	Drivers/Woods	35	95.00%	1.00	5.00	4.50	
DM210 Driver	1,050,000	Drivers/Woods	35	95.00%	1.00	5.28	0.00	
DM220 Driver	728,500	Drivers/Woods	35	95.00%	1.00	4.60	4.20	
DM230 Driver	1,500,000	Drivers/Woods	35	95.00%	1.00	5.28	0.00	
DW100 Driver	1,225,000	Drivers/Woods	35	95.00%	1.00	4.80	4.40	
DW150 Driver	875,000	Drivers/Woods	35	95.00%	1.00	5.50	5.00	
DW160 Driver	1,475,000	Drivers/Woods	35	95.00%	1.00	5.28	0.00	
DW170 Driver	819,000	Drivers/Woods	35	95.00%	1.00	4.80	4.40	
DW180 Driver	1,300,000	Drivers/Woods	35	95.00%	1.00	5.28	0.00	
DY120 Driver	811,000	Drivers/Woods	35	95.00%	1.00	4.40	4.00	
DY220 Driver	984,000	Drivers/Woods	35	95.00%	1.00	5.00	4.50	
Drivers/Woods			385	95.00%	11.00	5.06	2.42	
IM200 Irons	1,196,000	Irons	0	0.00%	0.00	5.50	4.50	
IM220 Irons	2,242,500	Irons	0	0.00%	0.00	5.70	4.50	
IM280 Irons	1,993,500	Irons	0	0.00%	0.00	5.30	4.50	
IM300 Irons	1,196,000	Irons	0	0.00%	0.00	5.28	0.00	
IM380 Irons	2,242,500	Irons	0	0.00%	0.00	5.28	0.00	
IW300 Irons	1,993,500	Irons	0	0.00%	0.00	5.28	0.00	
IW340 Irons	1,751,000	Irons	0	0.00%	0.00	5.10	4.50	
Irons			0	0.00%	0.00	5.35	2.56	

Production Plan

The data for this tab can be populated via real-time links from the *Plant Production* tab in the master planner's view. It shows plant managers their production allocation by product. They are able to make further schedule adjustments, see real-time impact on inventory as adjustments are made, and instantaneously view turnover metrics.

	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Se
Forecast/Actual	Actuals	Actuals	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	
Demand Volume	111,800	120,864	105,368	103,233	127,377	144,294	162,929	183,046	
Adjustment to Schedule	0	0	100,000	0	0	0	0	0	
Plant Schedule	111,800	120,864	205,368	103,233	127,377	144,294	162,929	183,046	1
INVENTORY SUMMARY									
Beginning Inventory	2,552,000	2,557,600	2,563,636	2,663,636	2,663,636	2,663,636	2,663,636	2,663,636	2.6
Production	117,400	126,900	205,368	103,233	127,377	144,294	162,929	183,046	1
Shipments	111,800	120,864	105,368	103,233	127,377	144,294	162,929	183,046	1
Projected Ending Inventory	2,557,600	2,563,636	2,663,636	2,663,636	2,663,636	2,663,636	2,663,636	2,663,636	2.6
Message									
Projected Inventory Turnover	6.37	6.19	5.99	5.95	5.88	6.45	11.71	6.71	
Target Inventory Turnover	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	
Target Inventory Days on Hand	73	73	73	73	73	73	73	73	
Target Inventory turns in periods	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	
% Yield per Product	98.00%	98.00%	98.00%	98.00%	98.00%	98.00%	98.00%	98.00%	
Production for Yield	114,082	123,331	209,559	105,339	129,976	147,239	166,254	186,782	1

Bottleneck Stats

This tab is used to input a plant's machine bottleneck metrics. A manager enters the anticipated bottlenecks along with associated downtime and changeover hours.

Machine	Input Y for the Bottleneck	Bottleneck Description	Machine Hrs per Day	Downtime Hrs per mo.	Changeover Hrs per mo.	All Downtime Hours
Machine 1	Yes	Press	24.00	1,500	1,000	2,500
Machine 2		Lathe	24.00	1,000	1,500	2,500
Machine 3		Finisher	24.00	1,000	1,000	2,000
Machine 4		Surface Grinder	24.00	1,000	0,500	1,500
Machine 5		Packager	24.00	1,000	1,000	2,000
Machine 6			24.00	0,000	0,000	0,000

Bottleneck Review

This tab requires no input. It contains assumption data for each machine in the plant. Data from the *Production Plan*, *Product Attributes*, and *Bottleneck Stats* tabs is linked to this cube. Resultant calculations show whether machine capacity is over or under required levels.

	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07
Bottleneck Description	Press	Press	Press	Press	Press	Press	Press	Press
Plant Schedule	1,500,770	1,524,395	1,579,771	1,470,737	1,440,215	1,579,521	2,507,093	1,629,715
Produced per Hour	325	325	325	325	325	325	325	325
Production for Yield	145,525	141,410	146,546	137,174	134,343	146,523	269,748	151,179
Machine Hrs Available	473	409	495	430	473	473	430	495
Machine Hrs Required	448	435	451	422	413	451	830	465
Machine Hrs Over/(Under) Capacity	(25)	27	(44)	(8)	(60)	(22)	400	(29)
Capacity Utilization	94.67%	106.51%	91.19%	98.16%	87.39%	95.32%	193.02%	94.07%
Machine Hrs	21.50	21.50	21.50	21.50	21.50	21.50	21.50	21.50
Work Days	22	19	23	20	22	22	20	23
% Yield per Product	1,078.00%	1,078.00%	1,078.00%	1,078.00%	1,078.00%	1,078.00%	1,078.00%	1,078.00%

Major Components

This tab contains information about the five main material components required for production by product, which is imported from source systems.

	Pric'd Year Inventory	Supplier Monthly Constraint	Lead Time (Days)	Safety Stock Amount	Component Cost
Steel Rods	2,500,000	750,000	25	300,000	1,000
Graphite Rods	2,000,000	850,000	30	250,000	1,000
Titanium Rods	2,000,000	900,000	40	300,000	1,000
Composite Rods	2,500,000	400,000	20	200,000	1,000
Tungsten Rods	2,500,000	900,000	0	200,000	1,000
Tru Shot Grips	2,500,000	750,000	15	300,000	1,000

Material Required

This tab contains information about the material components required for each individual product, which is imported from source systems.

	Steel Rods	Graphite Rods	Titanium Rods	Composite Rods	Tungsten Rods	Tru-Shot Grips
DM200 Driver	1	0	0	0	0	1
DM210 Driver	1	0	0	0	0	1
DM220 Driver	1	0	0	0	0	1
DM230 Driver	1	0	0	0	0	1
DW100 Driver	1	0	0	0	0	1
DW150 Driver	1	0	0	0	0	1
DW160 Driver	1	0	0	0	0	1
DW170 Driver	1	0	0	0	0	1
DW180 Driver	1	0	0	0	0	1
DY120 Driver	1	0	0	0	0	1
DY220 Driver	1	0	0	0	0	1

Material Mix

The data in this tab is linked from the *Material Required* and *Plant Volume* tabs. It shows the amount of material by product required to meet current plant demand production.

	Plant Schedule	Jan-07		Feb-07		M
		Plant Schedule	Material Required	Plant Schedule	Material Required	
DM200 Driver	111,800	167,700	120,864	181,296	205,368	
DM210 Driver	130,184	195,277	126,540	189,809	121,433	
DM220 Driver	194,729	292,093	177,679	266,519	200,019	
DM230 Driver	130,184	195,277	129,732	194,598	107,561	
DW100 Driver	111,037	166,556	115,816	173,725	97,560	
DW150 Driver	130,184	195,277	126,540	189,809	121,433	
DW160 Driver	194,729	292,093	177,679	266,519	200,019	
DW170 Driver	130,184	195,277	129,732	194,598	107,561	
DW180 Driver	110,924	166,236	115,594	173,392	97,365	
DY120 Driver	130,184	195,277	126,540	189,809	121,433	
DY220 Driver	194,729	292,093	177,679	266,519	200,019	
Drivers/Woods	1,568,770	2,353,154	1,524,395	2,286,593	1,579,771	
IM200 Irons	136,111	0	141,833	0	118,451	
IM220 Irons	160,223	0	154,535	0	146,984	

Material Planning

The data in this tab is linked from the previous material tabs to show the final results of material constraints. *Material Planning* allows for further input for material adjustment if the outcome shows material excess or a material shortage.

	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07
Prior Year Inventory	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000
Opening Inventory	2,500,000	896,846	360,253	(259,404)	(1,727,509)	(2,149,832)	(2,769,114)	(4,380,000)
Supplier Constraint	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Supplier Adjustment	0	1,000,000	1,000,000	0	1,000,000	1,000,000	2,000,000	1,000,000
Total Material Ordered	750,000	1,750,000	1,750,000	750,000	1,750,000	1,750,000	2,750,000	1,750,000
Material Required	2,353,154	2,286,593	2,369,657	2,218,105	2,172,323	2,369,281	4,361,833	2,444,572
Ending Inventory	896,846	360,253	(259,404)	(1,727,509)	(2,149,832)	(2,769,114)	(4,380,000)	(5,075,000)
Material shortage?			Yes	Yes	Yes	Yes	Yes	Yes
Excess Material								
Safety Stock	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Material Cost	\$2,353,154	\$2,286,593	\$2,369,657	\$2,218,105	\$2,172,323	\$2,369,281	\$4,361,833	\$2,444,572
Lead Time (Days)	25	25	25	25	25	25	25	25
Scheduled Release	2,286,593	2,369,657	2,218,105	2,172,323	2,369,281	4,361,833	2,444,572	2,321,000

Labor Attributes

This tab represents the labor data for the major positions at the plant. Information can be imported from source systems or input manually.

	Direct/Indirect	Average Htly Rate	Planned Increase %	Benefits %	Fully Loaded Rate	Hrs per Shift
Plant Management	Indirect	35.00	2.50%	30.00%	46.38	8
Assemblers	Direct	15.00	2.50%	30.00%	19.88	8
Machine Operators	Direct	14.00	2.50%	30.00%	18.55	8
Freight Handlers	Direct	13.00	2.50%	30.00%	17.22	8
Technicians	Indirect	22.00	2.50%	30.00%	29.15	8
Line Leads	Indirect	18.00	2.50%	30.00%	23.85	8
Sewing Machine Operators	Direct	15.00	2.50%	30.00%	19.88	8
Maintenance Crew	Indirect	14.00	2.50%	30.00%	18.55	8
Maintenance Supervisor	Indirect	18.00	2.50%	30.00%	23.85	8
Material Handlers	Direct	15.00	2.50%	30.00%	19.88	8
Packaging Crew	Direct	12.00	2.50%	30.00%	15.90	8
Quality Inspectors	Indirect	25.00	2.50%	30.00%	33.13	8
Electricians	Indirect	30.00	2.50%	30.00%	39.75	8
Total Labor		246.00	32.50%	390.00%	325.95	104

Labor Hours

This tab contains data for labor required by each workforce category for each product. Information may be imported from source systems.

	Assemblers		Machine Operators		Freight Handlers		Sewing Machine Operator	
	Hrs Required	Per no Product	Hrs Required	Per no Product	Hrs Required	Per no Product	Hrs Required	Per no Prod
DM200 Driver	0.300	100	0.250	100	0.250	100	0.000	
DM210 Driver	0.300	100	0.250	100	0.250	100	0.000	
DM220 Driver	0.300	100	0.250	100	0.250	100	0.000	
DM230 Driver	0.300	100	0.250	100	0.250	100	0.000	
D/W100 Driver	0.300	100	0.250	100	0.250	100	0.000	
D/W150 Driver	0.300	100	0.250	100	0.250	100	0.000	
D/W160 Driver	0.300	100	0.250	100	0.250	100	0.000	
D/W170 Driver	0.300	100	0.250	100	0.250	100	0.000	
D/W180 Driver	0.300	100	0.250	100	0.250	100	0.000	
DY120 Driver	0.300	100	0.250	100	0.250	100	0.000	
DY220 Driver	0.300	100	0.250	100	0.250	100	0.000	
Drivers/Woods	3,300	100	2,750	100	2,750	100	0.000	
IM200 Irons	0.300	100	0.250	100	0.250	100	0.000	
IM220 Irons	0.300	100	0.250	100	0.250	100	0.000	

Labor Planning

The final labor tab, *Labor Planning*, contains the calculated results of previous labor- related tabs and shows a plant’s final labor constraints. It contains information for both direct and indirect labor as well as labor cost.

	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07
1st Shift Hdct	35	38	35	37	36	36	40
2nd Shift Hdct	32	37	32	32	32	32	40
3rd Shift Hdct	30	35	30	31	30	30	40
Total Hdct	97.00	110.00	97.00	100.00	98.00	98.00	120.00
Direct Hrs Available	17,072.00	16,720.00	17,848.00	16,000.00	17,248.00	17,248.00	19,200.00
Direct Hrs Required	15,968.01	16,488.06	16,267.10	15,856.40	15,663.92	17,185.40	31,193.26
Dir Labor Utilization	99.39%	98.61%	91.14%	99.10%	90.82%	99.64%	162.46%
Dir Labor Over/(Under)	103.99	231.94	1,580.90	143.60	1,584.08	62.60	(11,993.26)
Dir Labor Shortage?							Direct Labor Shortage

Overhead Assumptions

The tab is used to input data for overhead driver and rates. Driver and rate data is applied to all products for the accounts selected. Users can tailor rows or columns to include more, less, or different accounts. In our example, five overhead accounts were selected, including one miscellaneous. A message appears if both rate and dollars are used.

	Variable Dvhd driver	Variable Dvhd rate %	Variable Dvhd \$	Message
Misc Variable Overhead	Units Produced	0.0000%	1.000	Enter either % or \$ rate
Freight	Units Produced	1.0000%	0.002	
Utilities	Labor Hrs	3.0000%	0.000	
Maint & Repair Machinery	Machine Hrs	1.0000%	0.000	
Warranty Repairs	Units Produced	0.0000%	0.001	

Production Constraints

This tab gives all users (including the master planner) a quick view of plant capacity constraints for material, machines, and labor. It will be used to assess the allocation of production among the various plants. In some cases, a plant manager may be able to change initial assumptions—for example, to hire additional headcount to meet increased demand. Likewise, if material shortages exist, a plant manager may be able to contract with alternate suppliers. Machine constraints may be less flexible. If plant demand does need to be renegotiated, the master planner may be able to shift demand to another plant or to a contractor in order to meet demand.

	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07	Sep-07	Oct-07
Labor Constraint					Direct Labor Shortage			Direct Labor Shortage		
Machine Constraint					Material Shortage					
Material Constraint										
Direct Hrs Required	61,871	74,509	47,073	51,084	67,961	96,109	82,414	92,716	55,145	
Direct Hrs Available	68,448	75,264	52,080	51,360	67,704	96,268	84,568	88,784	65,520	
Dir Labor Over/(Under)	6,576.58	655.25	5,007.16	275.55	(257.11)	178.94	2,154.18	(3,931.55)	10,375.46	11
Machine Hrs Required	5,862	7,069	4,460	4,940	6,439	9,106	7,809	8,785	5,225	
Machine Hrs Available	4,447	4,015	4,447	4,303	4,447	4,303	4,447	4,447	4,303	
Machine Hrs Over/(Under)	(1,415)	(3,054)	(13)	(537)	(1,992)	(4,803)	(3,362)	(4,338)	(922)	
Total Material Available	1,550,000	1,550,000	1,550,000	1,150,000	1,150,000	1,550,000	1,550,000	1,550,000	1,350,000	
Total Material Required	1,021,008	1,231,200	776,800	843,000	1,121,500	1,586,000	1,360,000	1,530,000	910,000	
Material Over/(Under)	528,992	318,800	773,200	307,000	28,500	(36,000)	190,000	20,000	440,000	

Plant P&L

The tab shows all plant production costs. Examination of this tab may be useful in assessing plant allocation. It is possible that production costs differ for each plant. Labor costs, for example, may vary by geographic location.

	Material Required	Material Mix	Material Planning	Labor Attributes	Labor Hours	Labor Planning	Overhead Assumptions	Production Constraints
Moine, IL								
	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07	Jul-07	Aug-07
Plant Volume	41,774,714	40,932,624	33,728,470	39,502,819	38,997,979	42,799,457	77,579,501	4
Net Sales	337,577,228	316,337,542	307,164,354	319,190,398	311,410,338	342,282,007	645,076,966	35
Labor	8,484,003	8,244,029	7,983,552	7,928,200	7,831,959	8,592,701	15,596,632	8
Material	5,656,002	5,496,019	5,322,368	5,285,467	5,221,306	5,728,467	10,397,755	5
Overhead	2,828,001	2,748,010	2,661,184	2,642,733	2,610,653	2,864,234	5,198,877	2
Variable Overhead Expense	5,720,174	5,558,377	5,483,890	5,345,435	5,280,546	5,793,462	10,515,727	6
Misc Variable Overhead	5,656,002	5,496,019	5,422,368	5,285,467	5,221,306	5,728,467	10,397,755	
Freight	56,560	54,960	54,224	52,955	52,213	57,295	103,978	
Utilities	1,782	1,731	1,708	1,665	1,645	1,804	3,275	
Maint & Repair Machinery	175	170	168	163	161	177	322	
Warranty Repairs	5,656	5,496	5,422	5,285	5,221	5,728	10,398	
Fixed Overhead Expense	93,428	88,531	101,590	91,796	114,883	122,975	106,848	
Plant Salaries-Indirect	66,328	62,031	75,090	65,296	88,383	96,475	80,348	
Truck & Automobiles	5,000	5,000	5,000	5,000	5,000	5,000	5,000	
Rental Exp Equip	500	500	500	500	500	500	500	
Depreciation	10,000	10,000	10,000	10,000	10,000	10,000	10,000	
Insurance Exp-Prop & Equip	1,000	1,000	1,000	1,000	1,000	1,000	1,000	
Other Misc Period Costs	10,000	10,000	10,000	10,000	10,000	10,000	10,000	
Total Overhead Expense	186,973	168,879	186,973	180,942	186,973	180,942	186,973	
Total Production Cost	16,960,006	16,489,058	15,967,105	15,856,401	15,663,917	17,185,402	31,193,264	17
Gross Profit	320,609,222	299,849,484	291,197,249	303,333,997	295,746,420	325,096,605	613,883,702	335

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