



Pertemuan 7 & 8

PERENCANAAN & PENGENDALIAN PRODUKSI

TIN 4113

• **Outline:**

– Master Production Planning / Jadwal Produksi Induk

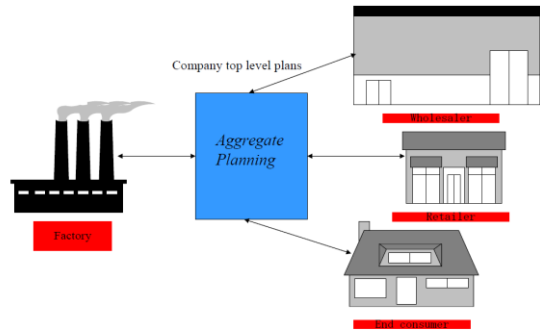
• **Referensi:**

– Smith, Spencer B., *Computer-Based Production and Inventory Control*, Prentice-Hall, 1989.



PRODUCTION PLANNING

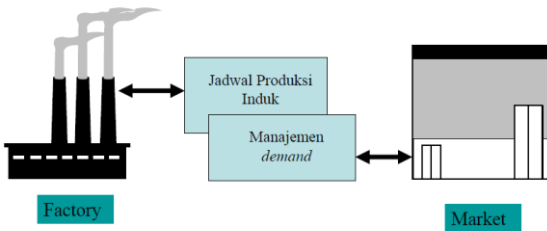
MASTER PRODUCTION SCHEDULING (JADWAL PRODUKSI INDUK)



Master Production Scheduling

• **Definition:**

– a statement of **what, how much, and when** end items are planned to be produced over planning periods. It is a **disaggregation** and implementation of the production plan.



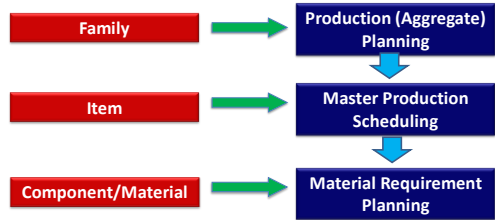
Master Production Scheduling



Functions:

- It schedules production and purchase orders for MPS items
- It is principal input to MRP system
- It is the basis for determining resource requirements
- It provides the basis for making delivery promises to customers

Product Level vs Production Planning



SOP vs. MPS



	PROCESS	
	Sales & Operations Planning	Master Scheduling
Objective	Supply Rate by Product Family	Anticipated Build Schedule
Item Planned	Product Family	End item or Planning Bill of Materials
Planning Horizon	Longest Lead Time Resource Plant and Equipment	Longest Cumulative Lead Time for End Items
Constraints	Resource Capacity	Critical Workcenters
Time Periods	Monthly	Weekly or Daily
Planning Focus	Product Volume	Product Mix
Process Output	Production Plan	Master Production Schedule

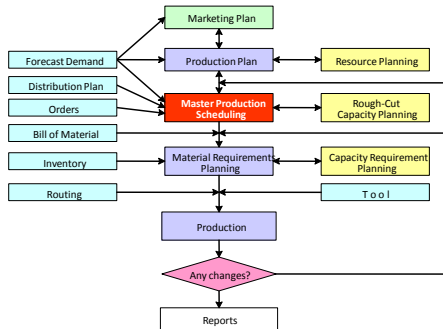
Production Plan Relationship to MPS



Product Family A	July	August	September	October	November
Working Days/ Month	22	21	23	20	19
Approved Production Plan from S&OP	22,000	21,000	23,000	20,000	19,000

MPS Week	40	41	42	43
Product A1	1,000	1,000	1,000	1,000
Product A2	500	1,000	1,500	2,000
Product A3	1,500	500	500	1,500
Product A4	2,000	2,500	2,000	500
Total	5,000	5,000	5,000	5,000

The Components of MRP II



Master Production Scheduling



Inputs:

1. Production Plan
MPS must be reconciled with Production Plan
2. Demand data
 - Sales forecast
 - Customer orders
 - Safety stocks
 - Field warehouse requirements
3. Inventory status
4. Ordering policy

Master Production Scheduling



• Planning Bills:

- BOM yang digunakan untuk memfasilitasi kemudahan dalam melakukan peramalan penjualan, perencanaan MPS, menentukan safety stock dan FAS (Final Assembly Schedule)
- Jenis-jenis Planning Bills:
 1. Modular Bills
 2. Super Bills

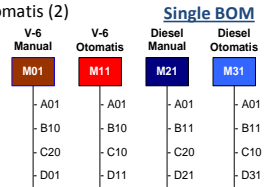
Master Production Scheduling



• Modular Bill

Contoh: sebuah mobil dapat dirakit dengan pilihan:

- Transmisi: Manual atau Otomatis (2)
- Mesin: V6 atau diesel (2)



Modular BOM

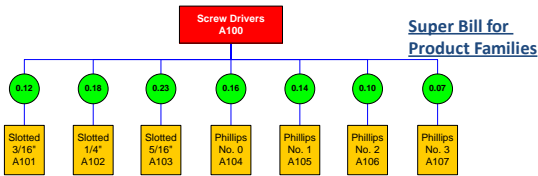
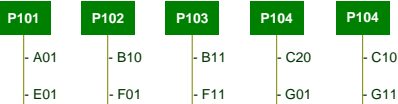
Semua Mobil	Mesin V-6	Mesin Diesel	Transmisi Manual	Transmisi Otomatis
A01	B10	B11	C20	C10
E01	F01	F11	G01	G11

Master Production Scheduling



• Super Bill

Super Bill for BOM Modules



Master Production Scheduling

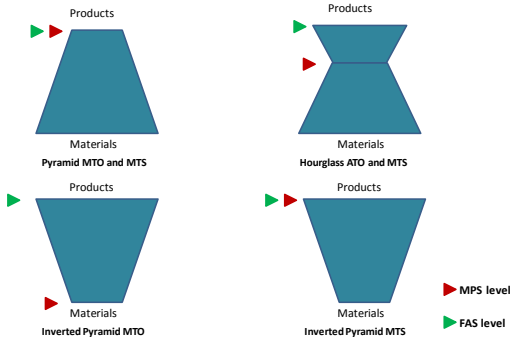


• Memilih Item:

- Menentukan efisien tidaknya pelaksanaan pembuatan MPS
- Pertimbangan:

1. Jumlah item sedikit untuk memudahkan dalam pembuatan dan evaluasi MPS
2. Item harus dapat diramalkan (pada MTS) sehingga karakteristik permintaan item dapat dianalisis
3. Setiap Item harus punya BOM sehingga MPS dapat digunakan sebagai dasar pembuatan MRP
4. Kapasitas yang dibutuhkan dari item-item yang akan diproduksi harus dapat dihitung
5. Item dalam MPS harus mudah diterjemahkan sebagai produk yang diminta customer

BOM Structures and FAS, MPS Level



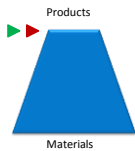
BOM Structures and FAS, MPS Level



• Pyramid BOM, Sistem Produksi MTO

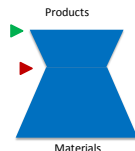
- Produk akhir jenisnya sedikit dan tidak distock karena harganya relatif mahal (mis: pesawat terbang, supercomputer) dimana produk dibuat sesuai spesifikasi yang diinginkan oleh customer
- MPS sama dengan Jadwal Perakitan Akhir (FAS)
- Cumulative Lead Time dapat dipercepat dengan cara melakukan peramalan permintaan dan MPS dibuat jangka waktu yang lebih panjang lagi sehingga pengadaan material dan fabrikasi dapat dilakukan lebih awal
- Pada kasus MPS yang belum sepenuhnya pasti dapat dinyatakan dalam satuan yang cocok seperti jam mesin, jam orang dll

BOM Structures and FAS, MPS Level



- **Pyramid BOM, Sistem Produksi MTS**
 - Digunakan untuk produk yang standard (TV, Radio, dsb)
 - MPS dan FAS sama
 - Bila variasi produk sedikit maka produk-produk tersebut bisa langsung dijadwalkan dalam MPS.
 - Untuk variasi produk banyak, sebaiknya MPS dinyatakan dalam keluarga produk (super bills). MPS dibuat dalam 2-level, pertama adalah tingkat produk family dan kedua adalah produk-produk itu sendiri

BOM Structures and FAS, MPS Level

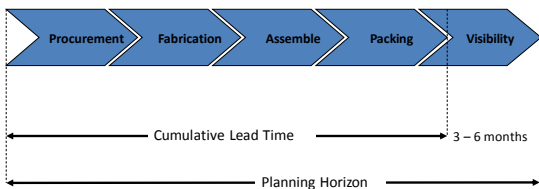


- **Hourglass BOM, Sistem Produksi ETO**
 - Tersedia banyak variasi produk akhir yang dapat diminta customer dimana setiap pilihan dirakit dari sejumlah komponen/subassembly (modul) dengan kombinasi yang berbeda-beda (contoh: mobil, PC)
 - MPS dibuat dengan pilihan-pilihan Subassembly level 1, komponen atau modul
 - Bila modul cukup banyak, gunakan super bills dengan MPS Two-level dengan Level-1 adalah produk generik, dan Level-2 adalah modul-modul pilihan.
 - Komponen dan Subassembly tingkat satu pada MPS ini kemudian dirakit menjadi produk jadi yang sebenarnya dengan FAS

Master Production Scheduling



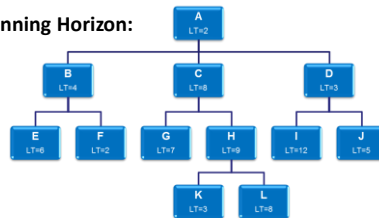
- **Planning Horizon:**



Master Production Scheduling



- **Planning Horizon:**

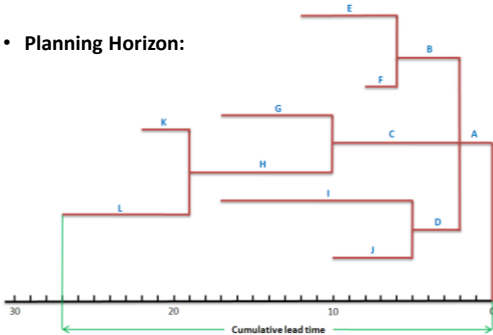


The length of each path is the sum of the lead times
 $E = E-B-A = 6+4+2 = 12$ $L = L-H-C-A = 8+9+8+2 = 27$
 $F = F-B-A = 2+4+2 = 8$ $I = I-D-A = 12+3+2 = 17$
 $G = G-C-A = 7+8+2 = 17$ $J = J-D-A = 5+3+2 = 10$
 $K = K-H-C-A = 3+9+8+2 = 22$

Master Production Scheduling



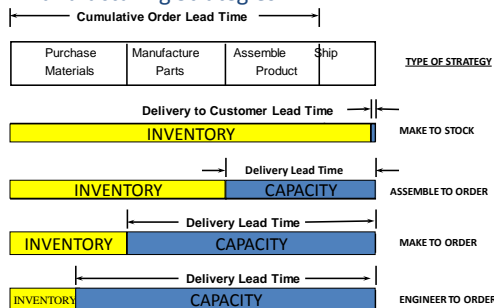
- **Planning Horizon:**



Master Production Scheduling

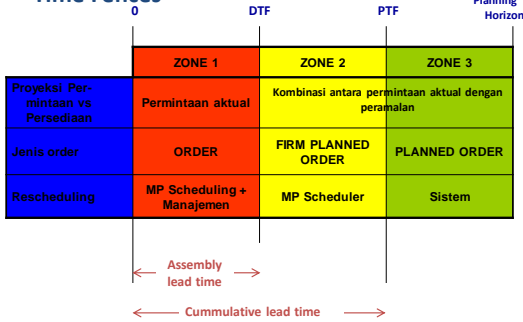


- **Manufacturing Strategies**



Master Production Scheduling

Time Fences



Master Production Scheduling

Planned order

Planned order is an order for future execution which is calculated automatically by the system

Firm planned order (FPO)

FPO is an order authorized by master scheduler but not yet release to manufacturing

Order

Order is production order that have been release to manufacturing

Master Production Scheduling

Content:

- Header : Item part number, item description, lead time, safety stock, order quantity policy, DTF and PTF
- Body : information for each time bucket through the planning horizon:
 - Forecast → forecast of independent demand
 - Production forecast → the calculated dependent demand
 - Actual demand → promised customer orders
 - MPS → the scheduled receipts of orders and FPOs
 - Projected available balance → a projection of the on-hand inventory less any allocations or back orders
 - Available to Promise (ATP) → the quantity from the current balance and from each MPS order that has not already been promised to customer and is, therefore, available to promise
 - Planned orders → by period in which they are scheduled to be received

The Example of MPS

MPS for an MTS Product (1)

Item no : X1736	Description : Generator
Lead time : 3 periods	Safety stock : 3 unit
Order Quantity : 3 periods net requirements	DTF : 0 period
	PTF : 5 periods

Period	PTF									
	1	2	3	4	5	6	7	8	9	
Forecast	5	3	8	2	7	5	8	4	10	
Production forecast										
Actual demand										
MPS				15						
Projected available balance	14	9	6	13	11	4	-1	-9	-13	-23
Available to promise										
Planned order						16			10	

For periods 6, 7, and 8 the net requirements is
 = Demand + Safety stock – Starting projected available balance
 = (5 + 8 + 4) + 3 – 4
 = 16

This will be the planned order to be received in period 6 and to be released in period 3

The Example of MPS

MPS for an MTS Product (2)

MPS might look one period later. Demand in period 1 was actually 7 (forecast = 5), so the projected available balances for periods 1 through 5 are lower by 2 units. The forecast for periods 2 through 9 is unchanged, but period 10 has been added with a demand of 7

Item no : X1736	Description : Generator
Lead time : 3 periods	Safety stock : 3 unit
Order Quantity : 3 periods net requirements	DTF : 0 period
	PTF : 5 periods

Period	PTF									
	2	3	4	5	6	7	8	9	10	
Forecast	3	8	2	7	5	8	4	10	7	
Production forecast										
Actual demand										
MPS			15		18					
Projected available balance	7	4	11	9	2	15	7	3	-7	-14
Available to promise										
Planned order									17	

The Example of MPS

MPS for an MTO

- Tidak akan ada ramalan/proyeksi stok karena produksi hanya dilakukan setelah ada pesanan langsung dari customer
- DTF dan PTF jatuh pada waktu yang sama
- Pesanan yang jatuh tempo di luar PTF dialokasikan sebagai Planned Order, sedangkan yang berada pada daerah PTF dialokasikan pada MPS

Item no : Y750	Description : Digital Controller
Lead time : 5 periods	Safety stock : 0 unit
Order Quantity : Lot for Lot	DTF/PTF : 6/6 period

Period	DTF/PTF								
	1	2	3	4	5	6	7	8	9
Forecast									
Production forecast									
Actual demand	5	5	7	3	4	2	1		
MPS	5	5	7	3	4	2			
Projected available balance									
Available to promise									
Planned order							1		

The Example of MPS

MPS for an MTO/MTS Product (1)



- Hybrid system
- Produk akhir terlalu mahal untuk di stok, tetapi harus tersedia sebelum ada permintaan
- MPS berdasarkan forecast, dan permintaan customer dipenuhi sesuai waktu yang dijanjikan
- Biasanya karakteristik produk hampir standard (*minor customizing*) sehingga MPS bisa dibuat berdasarkan ramalan sebelum pesanan customer benar-benar diterima

The Example of MPS

MPS for an MTO/MTS Product (2)



Item no	: Z438	Description	: Electronics microscope							
Lead time	: 3 periods	Safety stock	: 0 unit							
Order Quantity	: 4 periods net requirements	DTF	: 3 periods							
		PTF	: 6 periods							
		DTF	PTF							
Period		1	2	3	4	5	6	7	8	9
Forecast		7	8	3	5	10	11	6	9	15
Production forecast										
Actual demand		4	6	5	3	2	1			
MPS				18		28				
Projected available balance	11	7	1	14	9	27	16	10	1	-14
Available to promise		1		10		25				
Planned order										14

Available to Promise (ATP) = stok awal – total permintaan aktual dan permintaan sebelum MPS

$$\text{ATP (Period 1)} = 11 - 4 - 6 = 1$$

$$\begin{aligned} \text{ATP (Period 3)} &= \text{MPS (Period 3)} - \text{Actual demands (Period 3 and 4)} \\ &= 18 - 5 - 3 = 10 \end{aligned}$$

The Example of MPS

MPS for an MTO/MTS Product (3)



The MPS for one period later :

Item no	: Z438	Description	: Electronics microscope							
Lead time	: 3 periods	Safety stock	: 0 unit							
Order Quantity	: 4 periods net requirements	DTF	: 3 periods							
		PTF	: 6 periods							
		DTF	PTF							
Period	2	3	4	5	6	7	8	9	10	
Forecast	8	3	5	10	11	6	9	15	8	
Production forecast										
Actual demand	6	5	6	4	2	1				
MPS			18		28					
Projected available balance	7	1	14	8	26	15	9	0	-15	-23
Available to promise		1	7		21					
Planned order										23

TUGAS – Kelas E1



1. Jelaskan perbedaan Engineering BOM dengan Planning bill. Mengapa planning bill diperlukan?
2. Berikan contoh aplikasi modular bill dan super bill.
3. Jelaskan dan sebutkan komponen yang ada dalam planning horizon.
4. Hitung cumulative lead time dan MPS planning horizon untuk masing-masing produk yang anda pilih untuk contoh modular bill dan super bill di atas (jawaban no.2).
5. Berikan contoh masalah dan penyelesaian MPS untuk MTS, MTO, dan gabungan MTS/MTO.

• **Catatan:**

- Tugas individu, tidak boleh sama antar individu.
- Tulis tangan.
- Deadline: Senin, 4 Nopember 2013, jam 12:00.

Pertemuan 8 - Persiapan



• **Materi**

- MPS: Metode Disagregasi

SAMPAI JUMPA MINGGU DEPAN