Production Planning & Control
BMM4823

Aggregate Planning

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Chapter Description

- Aims
  - To understand the importance of aggregate planning in production planning
  - To apply the chase, level and mixed strategy in production planning

- Expected Outcomes
  - Able to determine the optimum cost in resources planning
  - Able to differentiate between chase, level and mixed strategies

- References
- Heizer, J and Render,B. 2011. Principles of Operations Management, 8th Edition, Pearson Prentice Hall, Inc.

Introduction

What is an aggregate planning?

The objective of an aggregate planning is to meet a forecasted demand while minimizing cost over the planning period.

Objectives

Minimizing the cost over the planning period by controlling

- Level of production
- Number of workers
- Level of Inventory
- Allocation of Overtime
- Subcontracting
- Other controllable variables

Aggregate planning

The primary focus of aggregate planning;

- Sales volume
- Customer requirement
- Production requirement e.g. rates, capacity
- Inventory
- Backlogs

Aggregate Planning Structure

Strategic Plan
Vision
Mission
Goals

Planning horizon

Short term	Task	Responsible
Short term Up to 3 months	**Work assignments** **Customer orders** **Work scheduling** **Dispatching** **Overtime** **Part-time**	**Production managers, Executive, Supervisors,**
Intermediate term (3 to 18 month)	**In between 3 to 18 months** **Marketing planning** **Production planning and budgeting** **Resources planning** **Inventory,** **Subcontracting** **Analyzing operating plans**	Production Managers
Long term	**Long-range plans (over one year)** **Research and Development** **New product plans** **Capital investments** **Facility location/expansion**	Chief executive

- Gather all information resources.
- Part of production planning system
- Need to detail out the plan
- Should be transferred into master production plan

Aggregate Planning

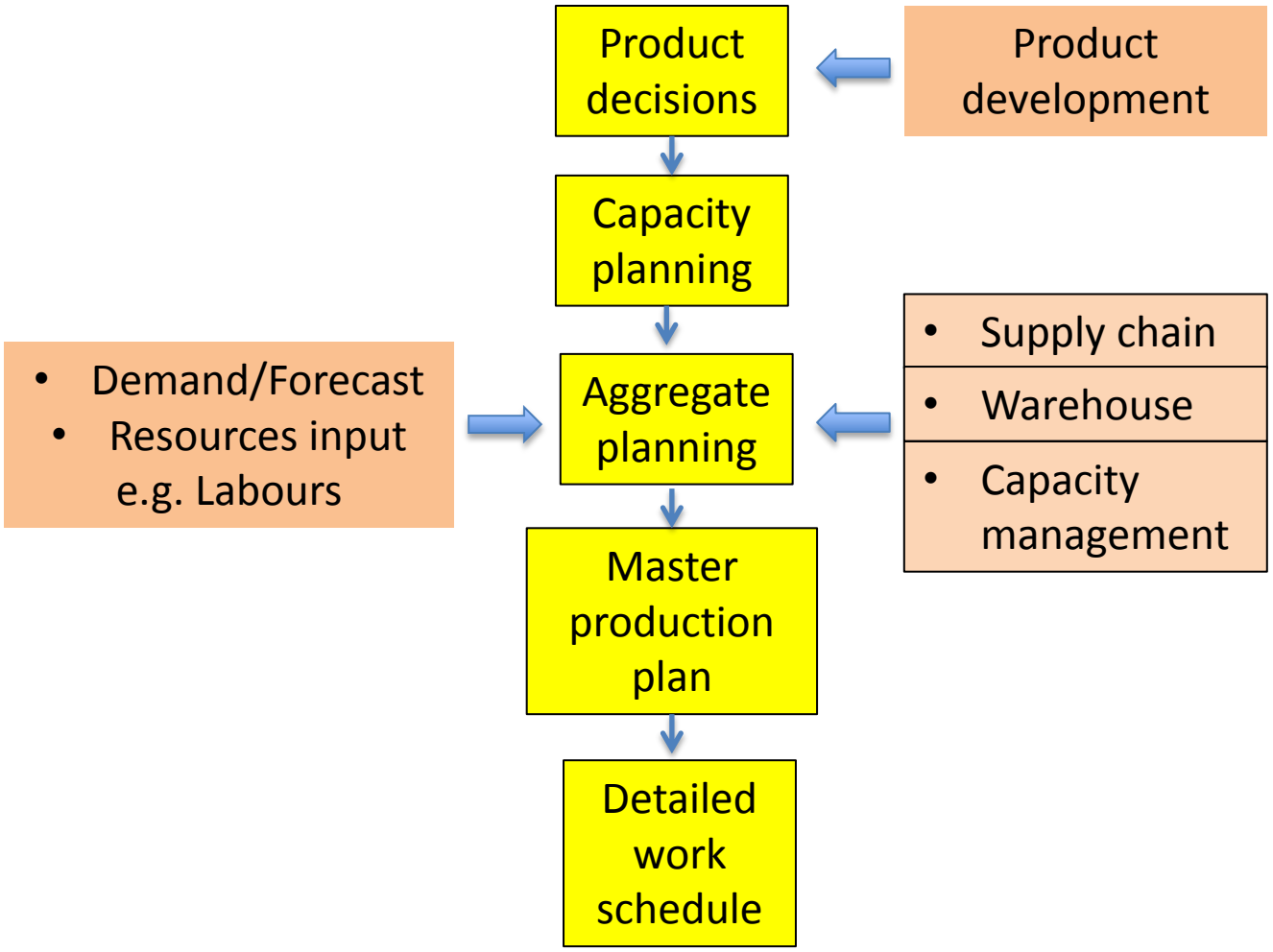
Jan - Mar		
Jan	Feb	Mar
160,000	130,000	120,000

Apr - Jun		
Apr	May	Jun
120,000	150,000	170,000

Jul - Sep		
Jul	Aug	Sep
175,000	145,000	135,000

Aggregate in product families with utilisation of same resources

Aggregate Planning



Aggregate planning strategies

There are strategies to absorb changes by;

1. **Using inventories**
2. **Varying number of workers**
3. **Hiring part-time worker, overtime, or idle time**
4. **Appoint subcontractors**
5. **Price strategies to influence demand**

Capacity option

- **Level of Inventory**
  - **Increase inventory to support demand**
  - **High level of inventory will increase other costs such as rental, insurance, space, handling, obsolete and capital investment.**
  - **But if shortages the company will suffer lost sales due to missed delivery and reputation.**

Capacity options

- **Varying number of workers by using hiring or firing strategies**
  - **Production rate as the demand.**
  - **Cost involved for hiring and firing such as training and etc.**
  - **New workers need time to adapt working method and procedures which will cause low productivity.**
  - **Low morale of workers when use firing strategy.**

Capacity options

- **Increase production quantity through overtime**
  - **Maintain constant workers**
  - **Trouble to meet high demand**
  - **Overtime will increase cost and may influence productivity**
  - **Idle time will influence production efficiency**

Capacity options

- **Subcontracting**
  - **Applied when there is peak demand**
  - **Too costly compared to overtime**
  - **Uncontrollable quality and delivery**
  - **Need frequently follow up and check their production**

Capacity options

- **Using part-time workers**
  - **Temporary action to do unskilled job like packaging, visual inspection and etc.**
  - **In servicing also frequently use part timers like restaurant, supermarket and etc.**

Demand options

- **Increasing demand**
  - **Offering discount**
  - **Use advertising or promotion**
  - **Production levelling**
  - **Sometime cannot be balanced between production and demand**

Demand options

- **Use back order strategy during high demand periods**
  - **Negotiation with customers**
  - **Should offer some initiatives e.g. discount, free delivery**
  - **Might lost sales**
  - **Customer not happy**

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Friday, 20 January 2017

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BY EUGENE MAHALINGAM

http://www.thestar.com.my/business/business-news/2017/01/20/this-is-the-default-headline/

Proton sees Iriz as key to Indonesian market

http://www.therakyatpost.com/business/2017/02/19/proton-sees-iriz-as-key-to-indonesian-market/

JAKARTA, 19 Feb 2017:

Aggregate planning

- **A mixed strategy is always good for optimising cost.**
- **Can be many possible strategies in mixed method**
- **Finding the optimal plan is not always possible**

Aggregate planning

- **Chase strategy**
  - **Always follow the demand by varying workforce size.**
  - **Practiced by many service companies, construction.**

Level strategy

- **Production rate is uniform**
- **Use same rate**
- **Same number of workers**
- **Support inventory to fulfil demand**
- **Consistent of quality and productivity**

Graphical methods

- **Commonly used by the planner**
- **Easy to be understood and implemented**
- **Limited computations**

Graphical Method

1. **Check the demand for every period**
2. **Identify the production capacity for regular time, overtime, and subcontracting each period**
3. **Identify all costs involved such as labor costs, hiring and firing costs and holding costs**

Example

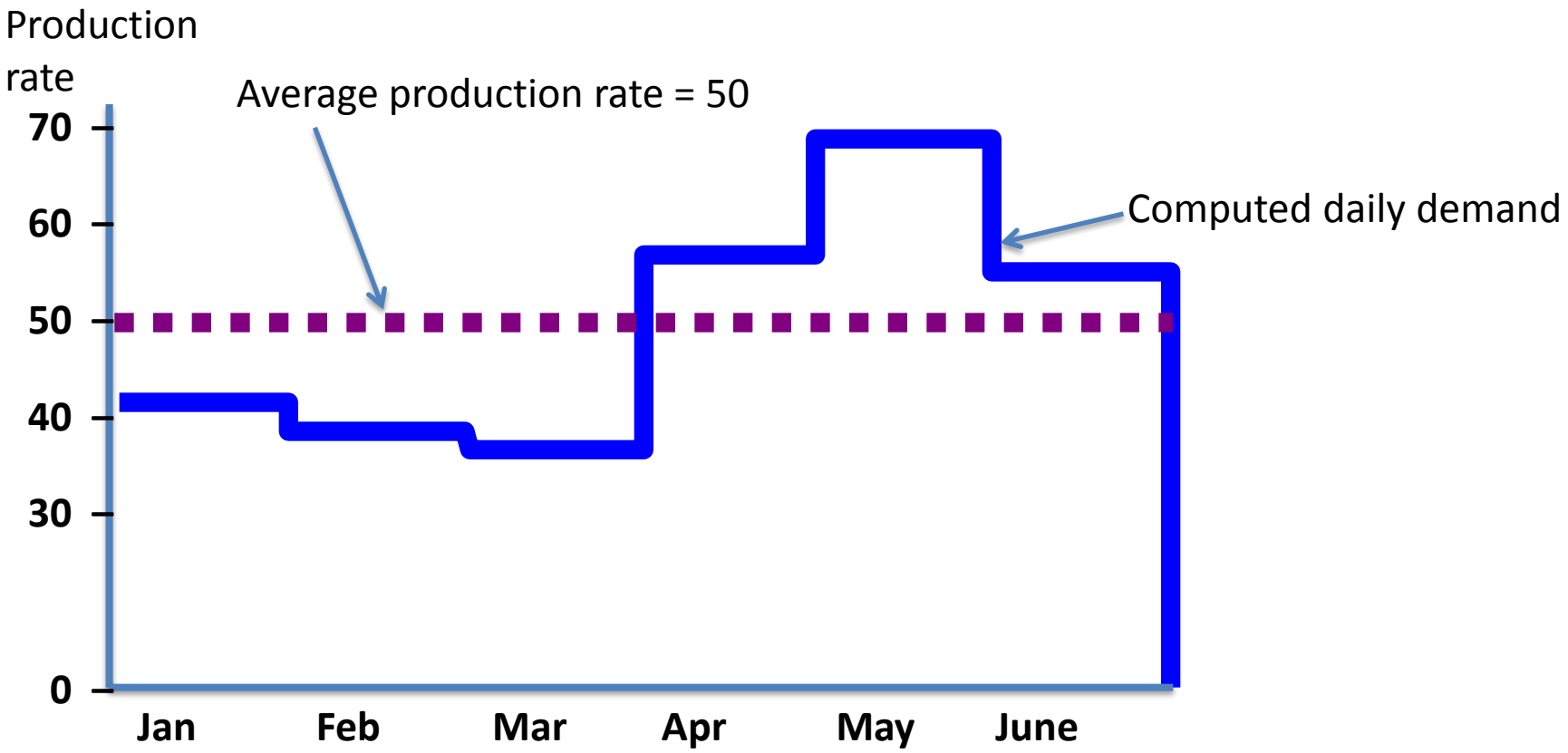
Always One Sdn Bhd., a special purpose machine manufacturer has developed monthly forecasts for their products. Data for the 6-month period January to June are presented in the following table. The going to use that data for development of an aggregate plan.

Compute the daily production rate for each period

Month	Demand	Production Days	Demand/ Day (computed)
Jan	900	22	41
Feb	700	18	39
Mar	800	21	38
Apr	1,200	21	57
May	1,500	22	68
June	1,100	20	55
Total	6,200	124	

$$\text{Average requirement} = \frac{\text{Total expected demand}}{\text{Number of production days}}$$

$$= \frac{6{,}200}{124} = 50 \text{ units per day}$$


Production rate
Average production rate = 50
Computed daily demand
70
60
50
40
30
0
Jan
Feb
Mar
Apr
May
June

Cost Information

Inventory carrying cost	RM5 per unit per month
Subcontracting cost per unit	RM20 per unit
Pay rate	RM10 per hour (RM80 per day)
Overtime	RM17 per hour (above 8 hours per day)
Labor-hours per unit	1.6 hours per unit
Cost of increasing daily production rate	RM300 per unit
Cost of decreasing daily production rate	RM600 per unit

Based on the production of 50 units per day. No inventory in hand.

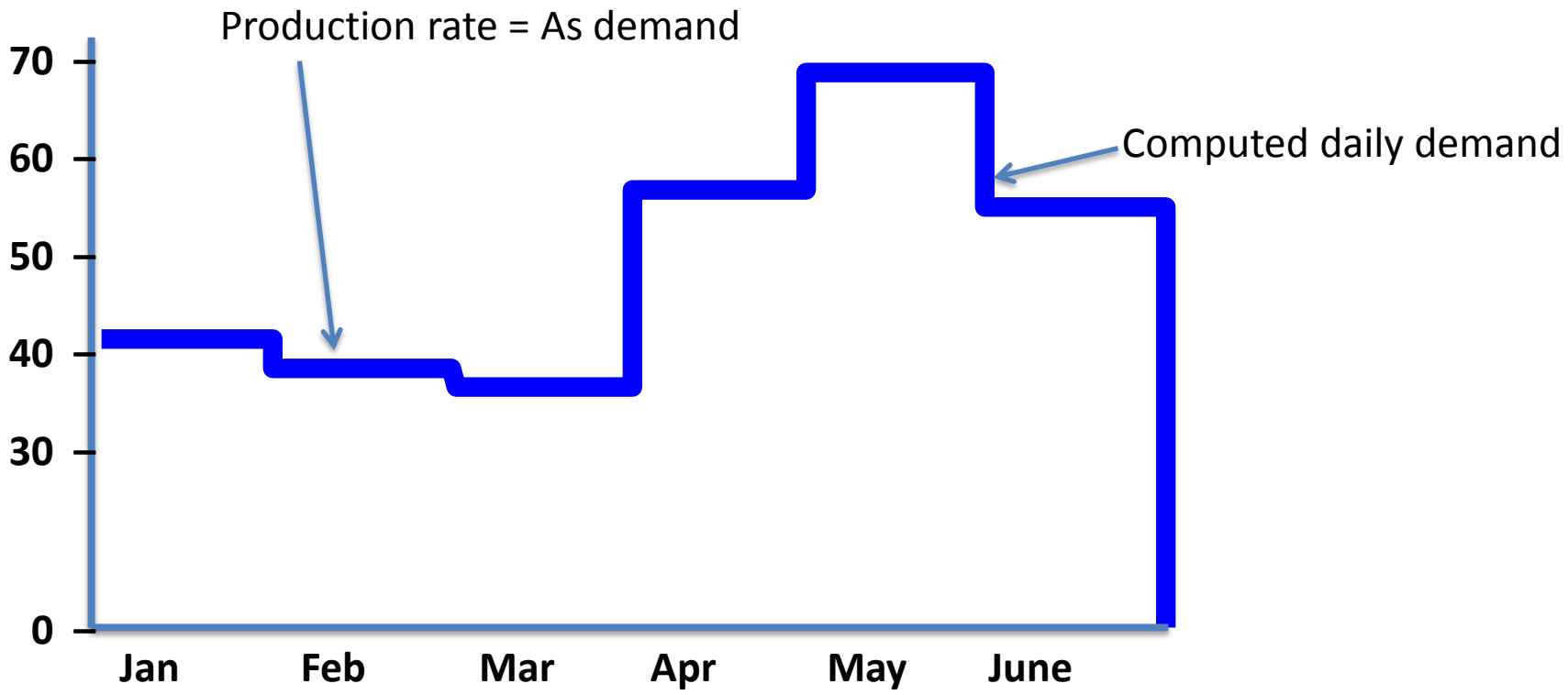
Mnth	Production Days	Production at 50 Units per Day	Demand Forecast	Monthly Inventory Change	Ending Inventory
Jan	22	1,100	900	+200	200
Feb	18	900	700	+200	400
Mar	21	1,050	800	+250	650
Apr	21	1,050	1,200	-150	500
May	22	1,100	1,500	-400	100
June	20	1,000	1,100	-100	0
					1,850

Level strategy

Costs		Calculations
Inventory carrying	RM9,250	(= 1,850 units carried x RM5 per unit)
Regular-time labor	99,200	(= 10 workers x RM80 per day x 124 days)
Other costs (overtime, hiring, layoffs, subcontracting)	0	
Total cost	RM108,450	

Chase strategy

Next strategy is using chase strategy. The production should follow as the demand.



Chase strategy

Month	Demand (units)	Daily Prod Rate	Production Cost (demand x 1.6 hrs/unit x RM10/hr)	Extra Cost of Increasing Production (hiring cost)	Extra Cost of Decreasing Production (firing cost)	Total Cost
Jan	900	41	RM 14,400	—	—	RM 14,400
Feb	700	39	11,200	—	RM1,200 (= 2 x $600)	12,400
Mar	800	38	12,800	—	RM600 (= 1 x $600)	13,400
Apr	1,200	57	19,200	$5,700 (= 19 x $300)	—	24,900
May	1,500	68	24,000	$3,300 (= 11 x $300)	—	24,300
June	1,100	55	17,600	—	RM7,800 (= 13 x $600)	25,400
			RM99,200	RM9,000	RM9,600	RM117,800

Comparison between plans

Cost	Plan 1	Plan 2
Inventory carrying	RM 9,250	RM 0
Regular labor	99,200	99,200
Overtime labor	0	0
Hiring	0	9,000
Layoffs	0	9,600
Subcontracting	0	0
Total cost	RM108,450	RM117,800

Anyhow you can try with other setting such minimum production quantity

Plan 1 is the lowest cost option

The End