

# Product mix and TOC

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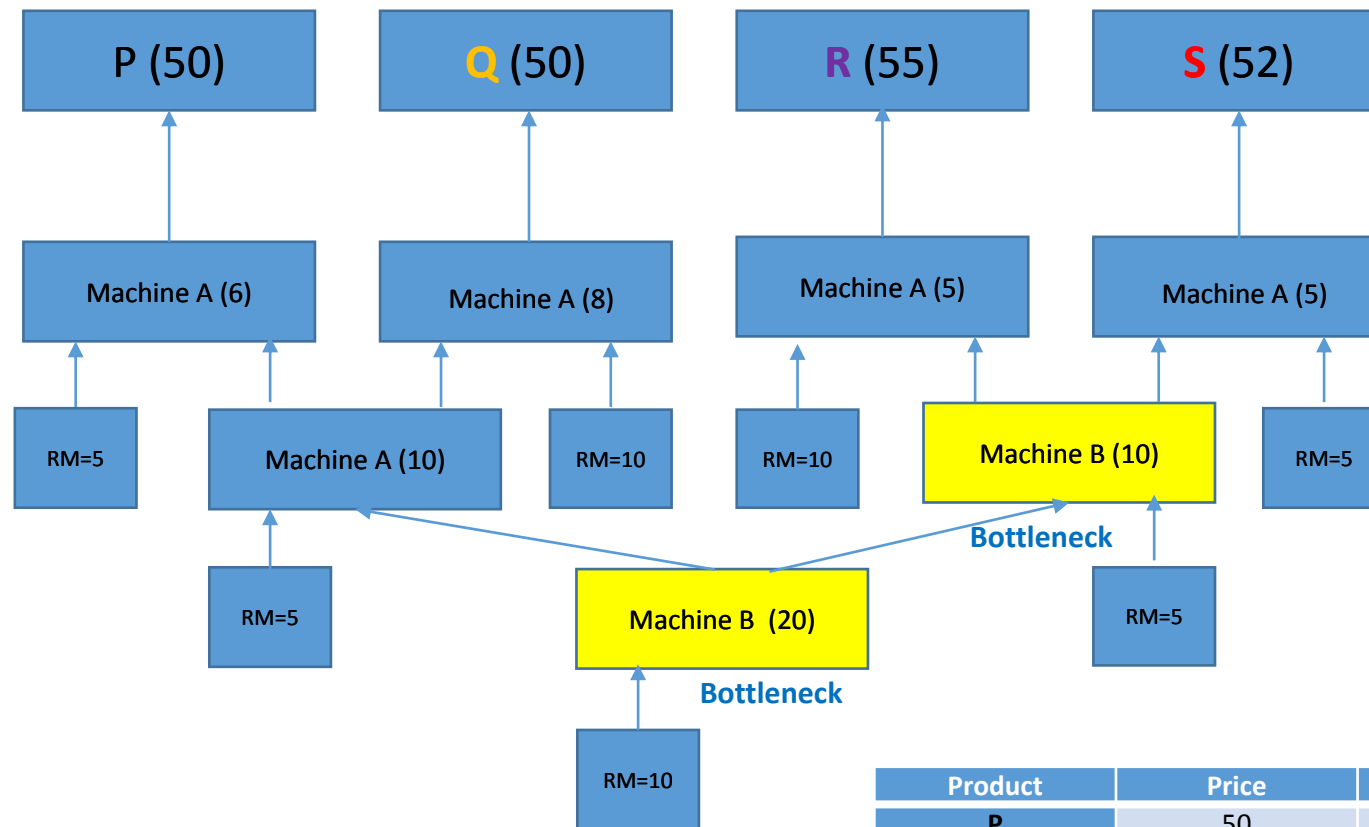
## Controlling parameters

8 hours /day=480 min cost/hour/resource=10 USD

To produce P or Q ->20 minutes of B (bottleneck)

To produce R or S->30 minutes of B (bottleneck)

Two workers are always needed to produce each of the four products



Product	Price	Material	Work (min USD)	Profit
P	50	20	36 min (6 USD)	50-20-6=24
Q	50	25	38 min (6,33 USD)	50-25-6,33=18,67
R	55	25	35 min (5,83 USD)	55-25-5,83=24,17
S	52	20	35 min (5,83 USD)	52-20-5,83=26,17

## Some calculations

Time in minutes calculated for all Machine centers  
(P->6+10+10), Q->8+10+20,....)

36 minutes ->  $36/60=0,6 \rightarrow 0,6 * 10 \text{ USD} = 6 \text{ USD}$  (cost of work)

38 minutes ->  $38/60=0,63 \rightarrow 0,63 * 10 \text{ USD} = 6,33 \text{ USD}$  (cost of work)

Cost of work/minute in USD -> time includes both machines (A and B)

RM=Raw Material

Price =Selling Price or in Dynamics Business Central Unit Price

Based on Prof. James R. Holt, Washington State University

# Four different approaches how to solve the product mix



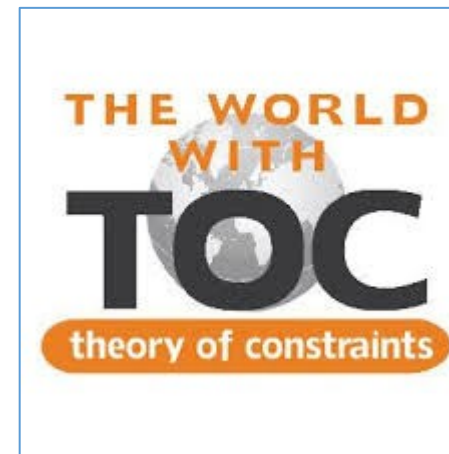
highest profit



highest selling price

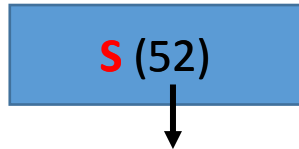


highest machine efficiency



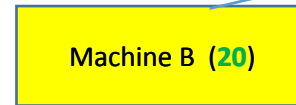
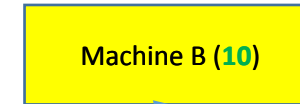
highest use of bottleneck

# Classic approach – highest profit (accountant) – **S** product



Cost of material

- $NP = T - OE = 52 * 16 \text{ pcs} - 20 * 16 \text{ pcs} - 2 \text{ workers} * 8 \text{ hours} * 10 \text{ USD/hour} = \underline{\underline{352 \text{ USD/day}}}$
- Where  $16 = 480 / 30 = 16 = 480 / (20 + 10)$
- $20 + 10$  is capacity of machine B (bottleneck) to produce **S**



Calculations for bottleneck B only !

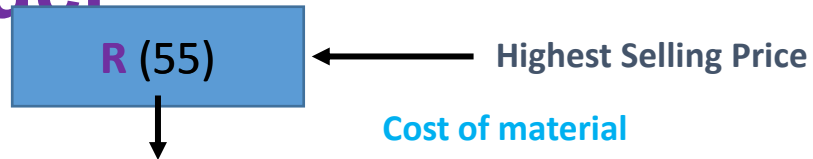
Product+	Price	Material	Work (min USD)	Profit
P	50	20	36 min (6 USD)	$50 - 20 - 6 = 24$
Q	50	25	38 min (6,33 USD)	$50 - 25 - 6,33 = 18,67$
R	55	25	35 min (5,83 USD)	$55 - 25 - 5,83 = 24,17$
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This table is used only for classic approach to choose product with highest profit (S)

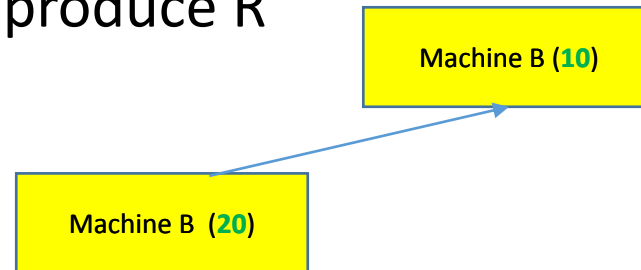
Cost of work/minute in USD calculation.

Calculated time of work includes both machines (A and B)

# Marketing approach – highest selling price R product



- $NP = T - OE = 55 * 16 \text{ pcs} - 25 * 16 \text{ pcs} - 2 \text{ workers} * 8 \text{ hours} * 10 \text{ USD/hour} = \underline{\underline{320 \text{ USD/day}}}$
- Where  $16 = 480 / 30 = 16 = 480 / (20 + 10)$
- $20 + 10$  is capacity of machine B to produce R



**Calculations for bottleneck B only**  
**Focused on the highest selling price**

# Production approach – highest machine efficiency $Q$ product

$Q$  (50)

Cost of material

- $NP-T-OE=50*24$  pcs -  $25*24$  pcs - 2 workers\*8 hours\*10 USD/hour = **440** USD/day
- Where  $24=480/20$  (the quantity of the product)
- $20$  is capacity of machine B to produce  $Q$

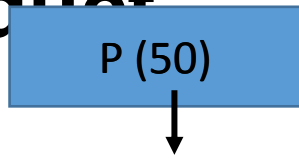


Machine B (20)

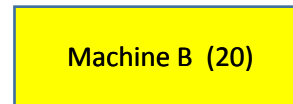
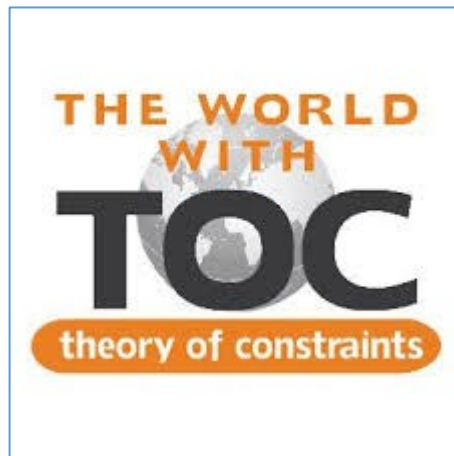
**Calculations for bottleneck B only**

**The intention is to produce as much as possible**

# TOC approach – highest use of bottleneck P product



- NP-T-OE =  $50 * 24$  pcs -  $20 * 24$  pcs - 2 workers \* 8 hours \* 10 USD/hour = **560** USD/day
- Where  $24 = 480 / 20$
- $20$  is capacity of machine B to produce **P** product



Calculations for bottleneck B only

The intention is highest use of bottleneck

Material costs are lower for product P than for product Q.

# Results

• Accounting approach	S	\$352	100%
• Sales-Higher Sales Price	R	\$320	90%
• Production-Efficiency	Q	\$440	125%
• <b>TOC approach</b>	<b>P</b>	<b>\$560</b>	<b>159%</b>





The  
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