Product mix and TOC

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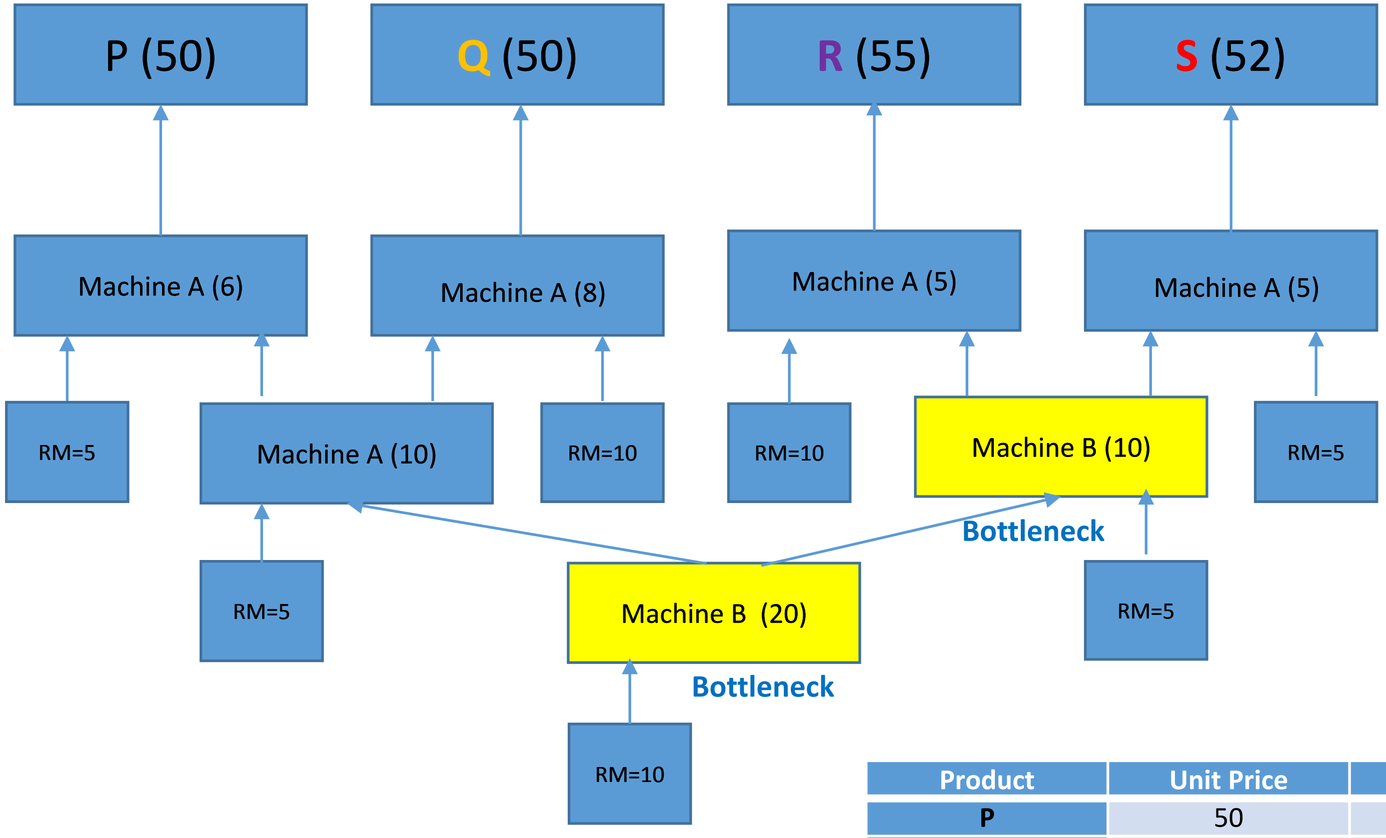

Task control parameters

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	Unit Price	Material Cost	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+20, Q->8+10+20,R->5+10+20, S->5+10+20

RM=Raw Material

Price =Selling Price or in Dynamics Business Central Unit Price

36 minutes -> 36/60=0,6->0,6*10 USD =6 USD (Cost of work)
38 minutes -> 38/60=0,63->0,63*10 USD= 6,33 USD (Cost of work)
Cost of work/minute in USD -> time includes both machines (A and B)

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

Four different approaches how to solve the product mix

THE WORLD WITH TOC

theory of constraints

Classic approach – highest margin 26,17 (accountant) – **S product**

NP=T-OE

Přímý materiál

Every machine is served by one worker (resource)

- 52*16 pcs - 20*16 pcs - 2 workers*8 hours*10 USD/hour = 352 USD/day
- Where 16= 480/30=16 = 480/(20+10)
- 30= 20+ 10 is capacity of machine B to produce S

Machine B (10)

Machine B (20)

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

Přímý materiál

Every machine is served by one worker (resource)

- 55*16 pcs - 25*16 pcs - 2 workers*8 hours*10 USD/hour = <u>320 USD/day</u>
- Where 16= 480/30=16 = 480/(20+10)
- 20+ 10 is capacity of machine B to produce R

Focused on the highest selling price

Production approach – highest machine efficiency Q product

- 50*24 pcs - 25*24 pcs - 2 workers*8 hours*10 USD/hour = 440 USD/day
- Where 24= 480/ 20
- 20 is capacity of machine **B** to produce Q

Machine B (20)

The intention is to produce as much as possible

TOC approach – highest use of bottleneck **P product**

Přímý materiál

Every machine is served by one worker (resource)

- 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

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%
• **TOC approach**	**P**	**\$560**	**159%**

Thanks for your attention