UTILIZATION OF CONSTRAINED RESOURCES

- Anything that prevents an organization from getting more of what it wants (for example, profits) is a <u>constraint</u>.

  - A particular machine may not have enough capacity to satisfy current demand.

  - Supplies of a critical part may not be sufficient to satisfy current demand.

- When the constraint is a machine or a work center, it is called a <u>bottleneck</u>.

- When capacity is not sufficient to satisfy demand, something must be cut back. Which products should be cut back and by how much?

  - Fixed costs are not usually affected by the decision of which products should be emphasized in the short run. All of the machines and other fixed assets are in place—it is just a question of how they should be used.

  - When fixed costs are unaffected by the choice of which product to emphasize, maximizing the total contribution margin will maximize total profits.

  - The total contribution margin is maximized by emphasizing the products with the greatest contribution margin per unit of the constrained resource.

UTILIZATION OF CONSTRAINED RESOURCES (continued)

EXAMPLE: Ensign Company makes two products, X and Y. The current constraint is Machine N34. Selected data on the products follow:

	X	Y
Selling price per unit	$60	$50
Variable expenses per unit..............	36	35
Contribution margin	$24	$15
Contribution margin ratio...............	40%	30%
Current demand per week (units)....	2,000	2,200
Processing time required on		
Machine N34 per unit...................	1.0 minute	0.5 minute

Machine N34 is available for 2,400 minutes per week, which is not enough capacity to satisfy demand for both product X and product Y. Should the company focus its efforts on product X or product Y?

CONTRIBUTION MARGIN PER UNIT OF THE CONSTRAINED RESOURCE

	X	Y
Contribution margin per unit (a)......	$24	$15
Constrained resource required to produce one unit (b)...................	1.0 minute	0.5 minute
Contribution margin per unit of the constrained resource (a)÷ (b)	$24 per minute	$30 per minute

- Product Y should be emphasized because it has the larger contribution margin per unit of the constrained resource. A minute of processing time on Machine N34 can be used to make 1 unit of Product X, with a contribution margin of $24, or 2 units of Product Y, with a combined contribution margin of $30.

UTILIZATION OF CONSTRAINED RESOURCES (continued)

- In the absence of other considerations (such as satisfying an important customer), the best plan would be to produce to meet current demand for Product Y and then use any remaining capacity to make Product X.

ALLOTING THE CONSTRAINED RESOURCE

Total time available on Machine N34 (a)............	2,400	minutes
Planned production and sales of Product Y	2,200	units
Time required to process one unit.....................	× 0.5	minute
Total time required to make Product Y (b).........	1,100	minutes
Time available to process Product X (a) – (b)	1,300	minutes
Time required to process one unit.....................	÷ 1	minute
		per unit
Planned production and sales of Product X	1,300	units

RESULTS OF FOLLOWING THE ABOVE PLAN

	X	Y	Total
Planned production and sales (units).....	1,300	2,200	
Contribution margin per unit.................	× $24	× $15	
Total contribution margin	$31,200	$33,000	$64,200

THE VALUE OF OBTAINING MORE OF THE CONSTRAINING RESOURCE

Ensign should be willing to pay up to $24 per minute for additional N34 machining capacity. This is because additional machine capacity would be used to produce more units of Product X. Product X earns $24 of contribution margin per minute of machine time.

UTILIZATION OF CONSTRAINED RESOURCES (continued)

MANAGING CONSTRAINTS

Processing more units actually demanded by customers through the bottleneck is the key to increased profits:

- Produce only what can be sold.

- Pay workers overtime to keep the bottleneck running after normal working hours.

- Shift workers from non-bottleneck areas to the bottleneck.

- Hire more workers or acquire more machines for the bottleneck.

- Subcontract some of the production that would use the bottleneck.

- Focus business process improvement efforts on the bottleneck.

- Reduce defects.

The potential payoff to effectively managing the constraint can be enormous.

EXAMPLE: Suppose the available time on Machine N34 can be increased by paying the machine's operator to work overtime. Would this be worthwhile?

ANSWER: Because the additional time would be used to make more of Product X, each minute of overtime is worth $24 to the company and hence each hour is worth $1,440 (60 minutes × $24 per minute)!