



FENCETECH

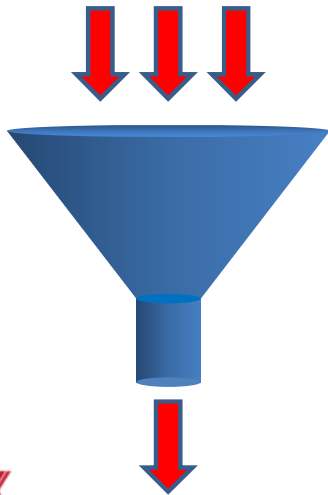


METALfab

PHOENIX

2018

“Theory of Constraints” by Dr. Eliyahu (Eli) Goldratt



Presented by:

Terry Barrett
Pinpoint Solutions
Jupiter, FL
Phone: 561-801-7549
Email: pps-tb@bellsouth.net



Do you have any of these symptoms?

- Breaking into jobs to expedite others
- Long lead times
- No money in your pocket at the end of the day
- Do not want to grow for fear you cannot control it
- Not sure which projects are the ones that make true money
- Hard to get employees to relate to terms like net profit, sales, cost, expenses, etc.
- Working weekends and late at night to stay caught up
- Used the phrase “Yeah, but I can get it done faster, if I do it myself”

Session 1 - 11:00 am to 12:00 pm

Goals for Session 1:

- Define the Theory of Constraints (TOC)
- Understand how it transcends any industry, institution or office environment
- Identify the five steps to address a constraint
- Introduce several terms:
 - Constraint and bottlenecks
 - Dependent events & statistical fluctuations
 - Subordinate
 - “Herbie”

Session 2 - 1:00 pm to 2:00 pm

Goals for Session 2:

- Challenge the traditional cost accounting method
- Provide a new method for decision making and change your current paradigms
- Identify a very powerful way of using new, simple indicators to help you make staffing decisions and assignments, as well as company policies and procedures
- Introduce several terms:
 - Throughput- Operating Expenses- Inventory
 - A different calculation for Net Profit & Return on Investment (ROI)

“The Goal”

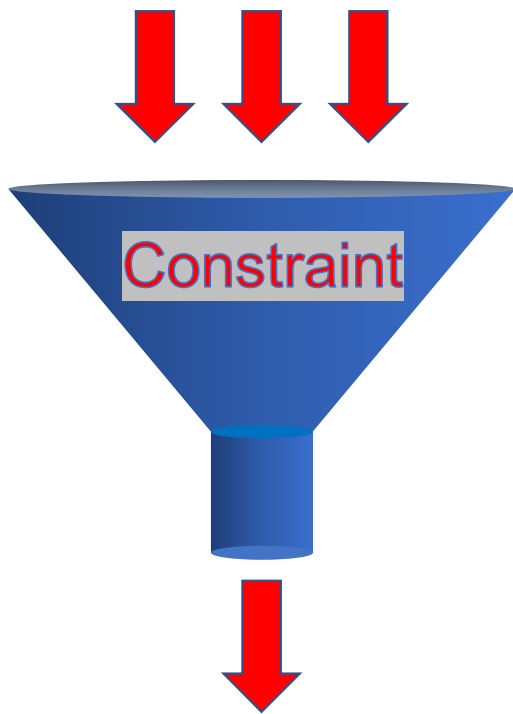


“MAKE MONEY”



What is the Theory of Constraints (TOC)?

- The basic premise is that most systems, processes, and companies have excess capacity. The challenge is to find where it is at and how to expose and exploit it.
- TOC gives you the framework and ability to identify the constraint (bottleneck) and deal with it in a manner that will increase your available capacity.



What is blocking the use of that capacity is typically a constraint (bottleneck), much like a funnel restricting flow.

**THE PROBLEM: ONCE YOU LOSE
AN HOUR AT A CONSTRAINT, IT
TYPICALLY IS LOST FOREVER.**

Who Uses TOC?

- Aerospace
 - Boeing
- Automotive
 - Ford, General Motors, Toyota
- Construction
 - 3M, Kraft Foods
- Education
 - American Express
- Healthcare
 - Bristol Myers
- Information Technology
 - Callaway Golf
- Manufacturing
 - Coca- Cola
- Marketing
 - Honda
- Retail
 - IBM
- Services
 - Microsoft
 - Amazon

So, we are NOMMA and AFA members.

Does it fit? Why should we use it?

- TOC is a generic theory that does not subscribe or fit into a specific “box”.
 - TOC is not going to teach you how to cut, weld, install, etc.
 - It doesn't matter whether you are large or small.
 - Or what industry or function you are in.
- It is going to teach you how to leverage all parts of your assets (both equipment and humans) to achieve

“The Goal”

So what are Constraints?

- **Physical:** Equipment, lack of people/space, shortages
- **Policy:** Required or recommended ways of working (can be “How things are done here), overtime, bonuses, government regulations.
- **Paradigm:** Deeply engrained beliefs or habits
- **Market:** When production capacity exceeds sales

New Terms

- Throughput
- Dependent events
- Statistical fluctuations
- Subordinate
- “Herbie”

5 Steps to Attack a Constraint

1. IDENTIFY the System's Constraint(s).

- Don't ever assume your constraint is always in production. It can be your:
 - Customers, office workers, detailers, outside painters, vendors, markets, and sales
 - As well as your administrative, production, finishing and installation processes.

5 Steps to Attack a Constraint

1. IDENTIFY the System's Constraint(s) (cont)

- Look for:
 - Piles of material, parts, work orders, paperwork, etc
 - Measure the number of contracts/payments not received, the number of drawings out for approval (and for how long), expediting, etc.

Unfortunately, many times in small businesses,
The Constraint is You!

5 Steps to Attack a Constraint

2. Decide how to EXPLOIT the system's constraint(s).

- The output of the constraint restricts the output of the whole system.
- You need to squeeze as much as possible out of it.
- Maximize the utilization and productivity.

5 Steps to Attack a Constraint

2. Decide how to EXPLOIT the system's constraint(s) (cont)

- Can you stagger lunches?
- Substitute additional equipment even though it may not be as efficient?
- Outsource? Transfer some portions of the work away from the constraint?

One Rule: Don't ever “starve” a constraint!!

* Examples

5 Steps to Attack a Constraint

3. SUBORDINATE everything else to the above decision.

- Limit access to the constraint, i.e. reduce interruptions.

Are the materials, paperwork, and drawings arriving ahead of time to the constraint?

ALL HANDS “ON DECK”

- All others must be aware that should the constraint need anything, or is doing something that others can do, they should intervene and assist.
- And this behavior should be “applauded”.



* Examples

5 Steps to Attack a Constraint

4. ELEVATE the system's constraint(s).

- If the constraint still exists and has reached its capacity, additional equipment, manpower, etc. may be needed to eliminate the constraint.
- However, this step should not be taken by jumping over the previous two steps.
- Studies show that the first three steps virtually always expose additional capacity within a few months. This capacity is free of cost, without substantial investment!

Resist the urge!

* Examples

5 Steps to Attack a Constraint

4. ELEVATE the system's constraint(s) (cont)

As a special note, you do not want to go out and buy new equipment because it is the “latest and greatest”, “cool”, “impressive”, or because you feel “I must have it”.

- Before you do, rationalize how it will affect your constraint. The last thing you want to do is throw money at something that will not improve your Throughput.

* Examples

5 Steps to Attack a Constraint

5. WARNING!!

- If in the previous four steps, a constraint has been broken, go back to Step #1.
- Don't fool yourself that your work is complete. There are still constraints in your system – some that may appear because of breaking the prior constraint.

Meaning:

Return to Step #1, because you now have a new constraint.

* Examples

Session 2 - 1:00 pm to 2:00 pm

Goals for Session 2:

- Challenge the traditional cost accounting method
- Provide a new method for decision making and change your current paradigms
- Identify a very powerful way of using new, simple indicators to help you make staffing decisions and assignments, as well as company policies and procedures
- Introduce several terms:
 - Throughput- Operating Expenses- Inventory
 - A different calculation for Net Profit & Return on Investment (ROI)

Three New Measures

- Throughput (T): Sales/Shipments less truly variable costs (i.e. raw material, sales commissions, freight)
- Investment (I): Money tied up in physical things, such as product, inventory, machinery & equip., real estate, etc.
- Operating Expense (OE): Money spent to create throughput, other than truly variable costs(i.e. payroll, utilities, taxes, etc.)

These measures can be calculated at the company, department, or process level if needed. (More on this later.)

Four New Ratios

- **Net profit** = Throughput- Operating Expenses
- **Return on Investment (ROI)** = New Profit / Investment
- **Productivity** = Throughput / Operating Expenses
- **Investment Turns** = Throughput/ Investment

TOC's premise is to:

Focus less on cutting expenses (Investment and Operating Expenses)
and Focus more on building sales (Throughput)

Don't chase the minutiae!

How can you focus your thought processes onto Throughput and away from the old traditional accounting systems and the day-to-day chaos?

With a simple Throughput calculation against the hours you have available at your constraint (bottleneck).

Typical Throughput/Constraint Calculation Examples

Example 1:

Annual Sales (shipped) = \$250,000

minus 10% raw material - 25,000

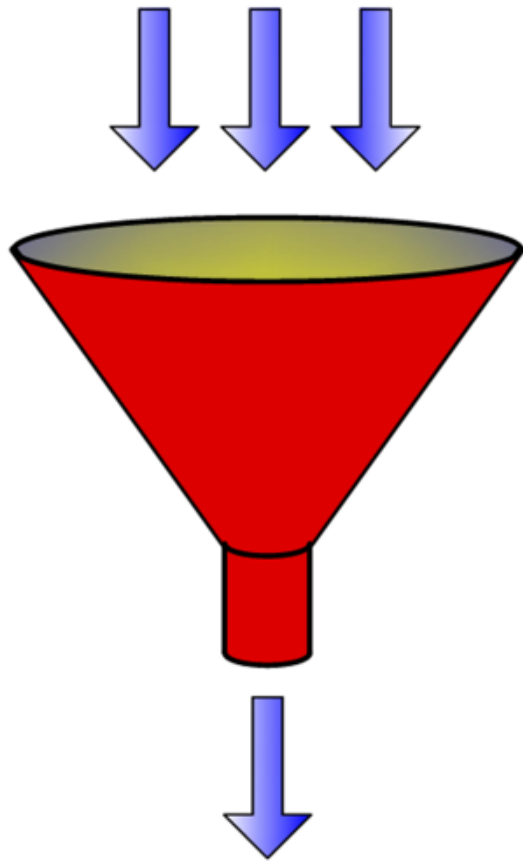
Throughput = \$225,000

divided by 1,800 hrs*

Throughput \$'s per hour **\$125**

*Each resource @ 1,800 hours per year

Example #1



\$125 Throughput (T) impact

Remember: An hour lost at a
constraint is an hour lost of
Throughput

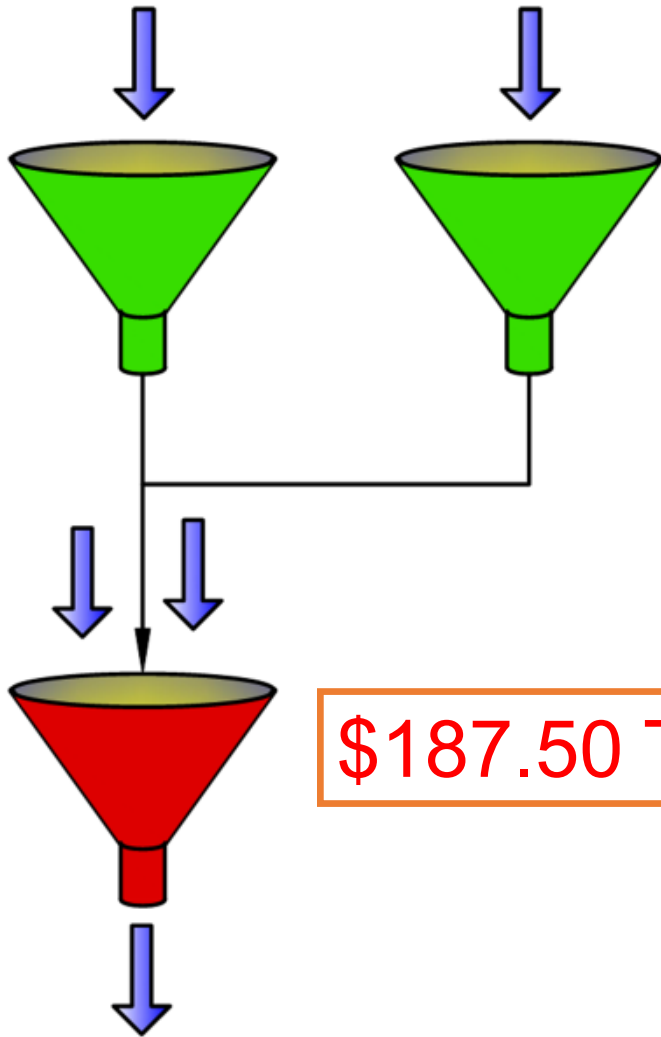
Typical Throughput/Constraint Calculation Examples

Example 2:

$$\begin{array}{rcl} \text{Annual Sales (shipped)} & = & \$375,000 \\ \text{minus 10\% raw material} & - & \underline{37,500} \\ \text{Throughput} & = & \$337,500 \\ \text{divided by} & & \underline{1,800 \text{ hrs}^*} \\ \text{Throughput \$'s per hour} & & \text{\textcolor{red}{\$187.50}} \end{array}$$

*One resource @ 1,800 hours per year

Example #2



\$93.75 T impact
Two resources

\$187.50 T impact

Red funnels- Constraint
Green funnels- No Constraint

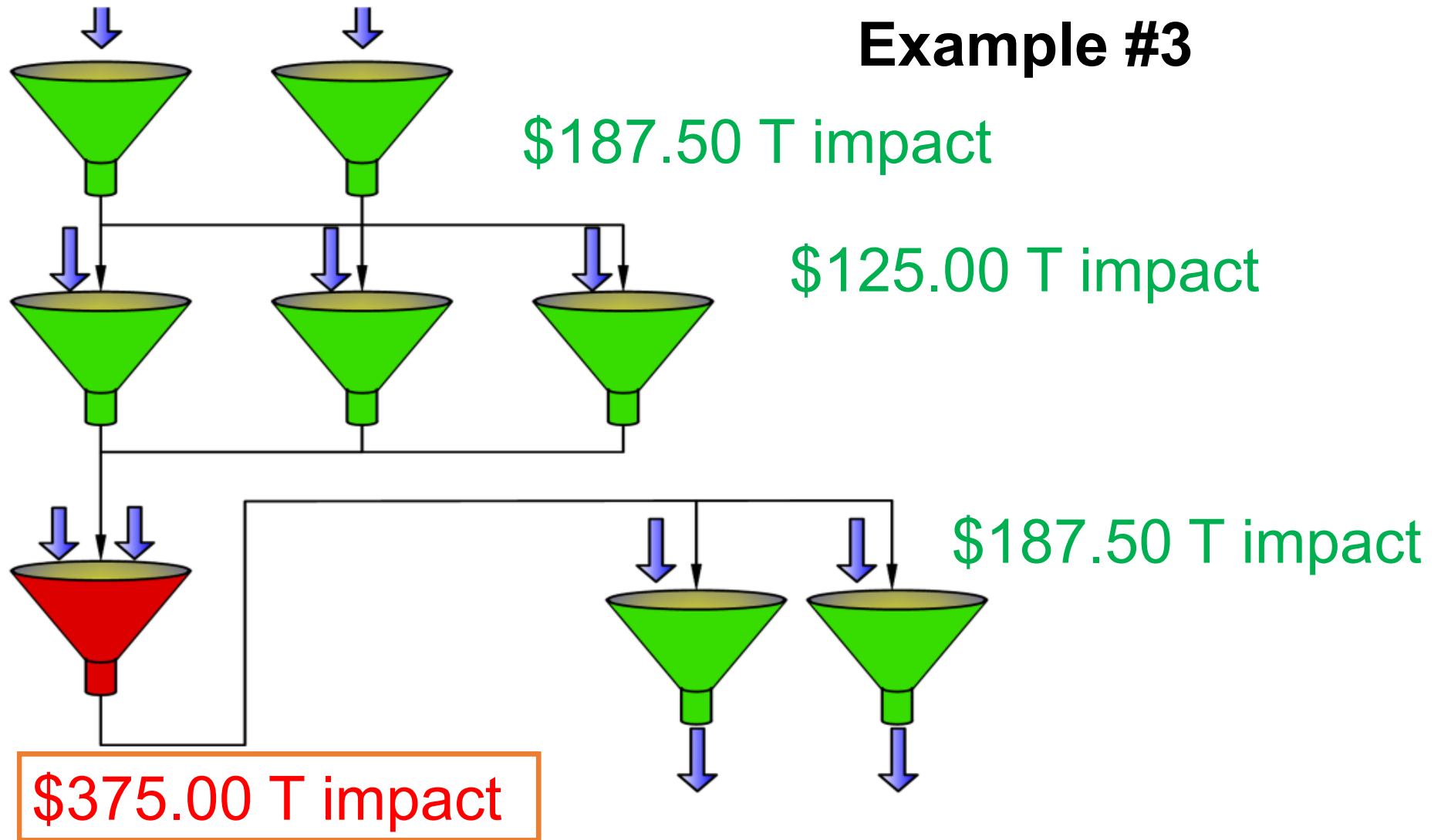
Typical Throughput/Constraint Calculation Examples

Example 3:

$$\begin{array}{rcl} \text{Annual Sales (shipped)} & = & \$750,000 \\ \text{minus 10\% raw material} & - & \underline{75,000} \\ \text{Throughput} & = & \$675,000 \\ \text{divided by} & & \underline{1,800 \text{ hrs}^*} \\ \text{Throughput \$'s per hour} & & \text{\textcolor{red}{\$375.00}} \end{array}$$

*Each resource @ 1,800 hours per year

Example #3



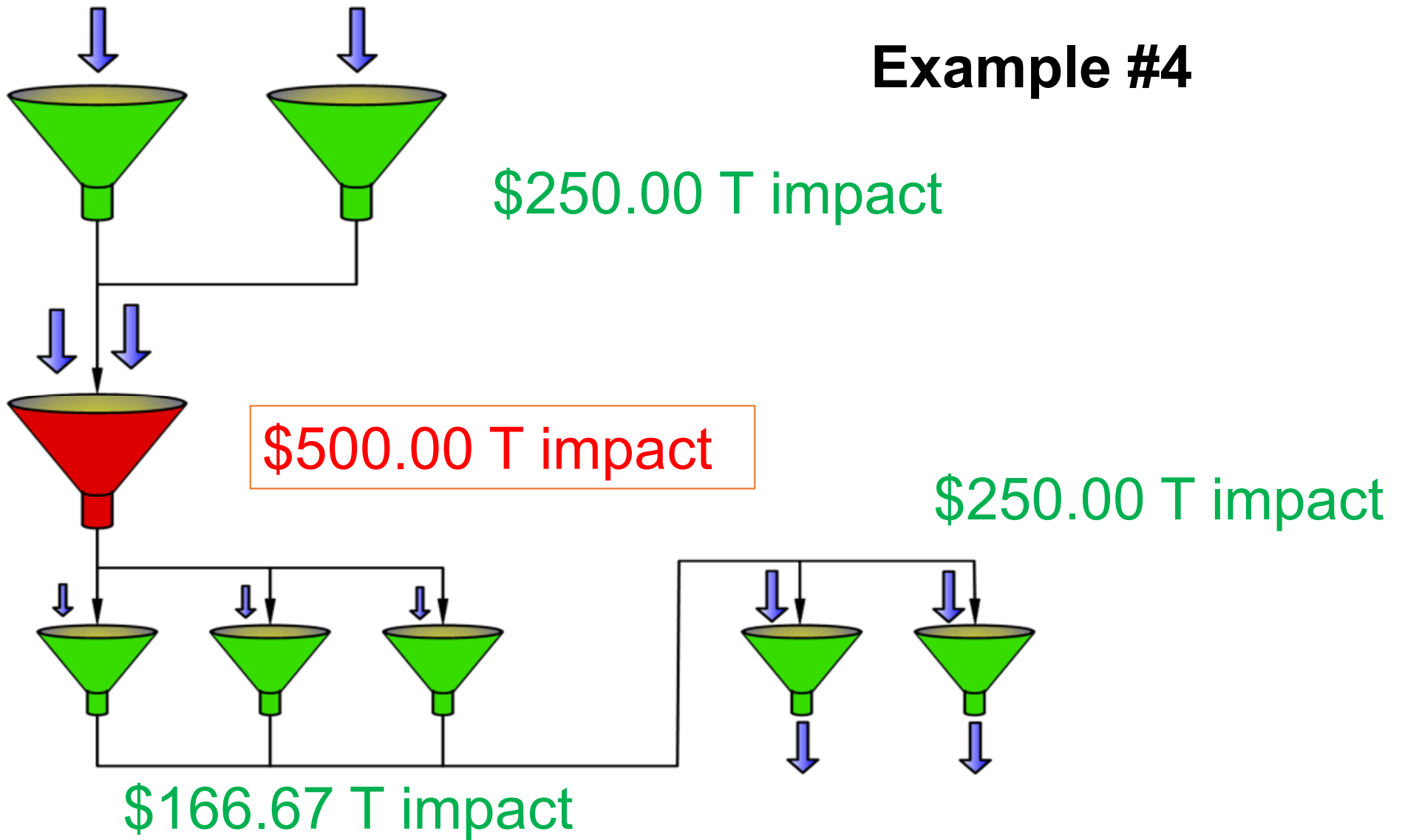
Typical Throughput/Constraint Calculation Examples

Example 4:

$$\begin{array}{rcl} \text{Annual Sales (shipped)} & = & \$1,000,000 \\ \text{minus 10\% raw material} & - & \underline{100,000} \\ \text{Throughput} & = & \$900,000 \\ \text{divided by} & & \underline{1,800 \text{ hrs}^*} \\ \text{Throughput \$'s per hour} & & \text{\textcolor{red}{\$500.00}} \end{array}$$

*Each resource @ 1,800 hours per year

Example #4



Typical Throughput/Constraint Calculation Examples

Example 5:

$$\begin{array}{rcl} \text{Annual Sales (shipped)} & = & \$2,000,000 \\ \text{minus 10\% raw material} & - & \underline{200,000} \\ \text{Throughput} & = & \$1,800,000 \\ \text{divided by} & & \underline{1,800 \text{ hrs}^*} \\ \text{Throughput \$'s per hour} & & \text{\textcolor{red}{\$1,000.00}} \end{array}$$

*Each resource @ 1,800 hours per year

Example #5

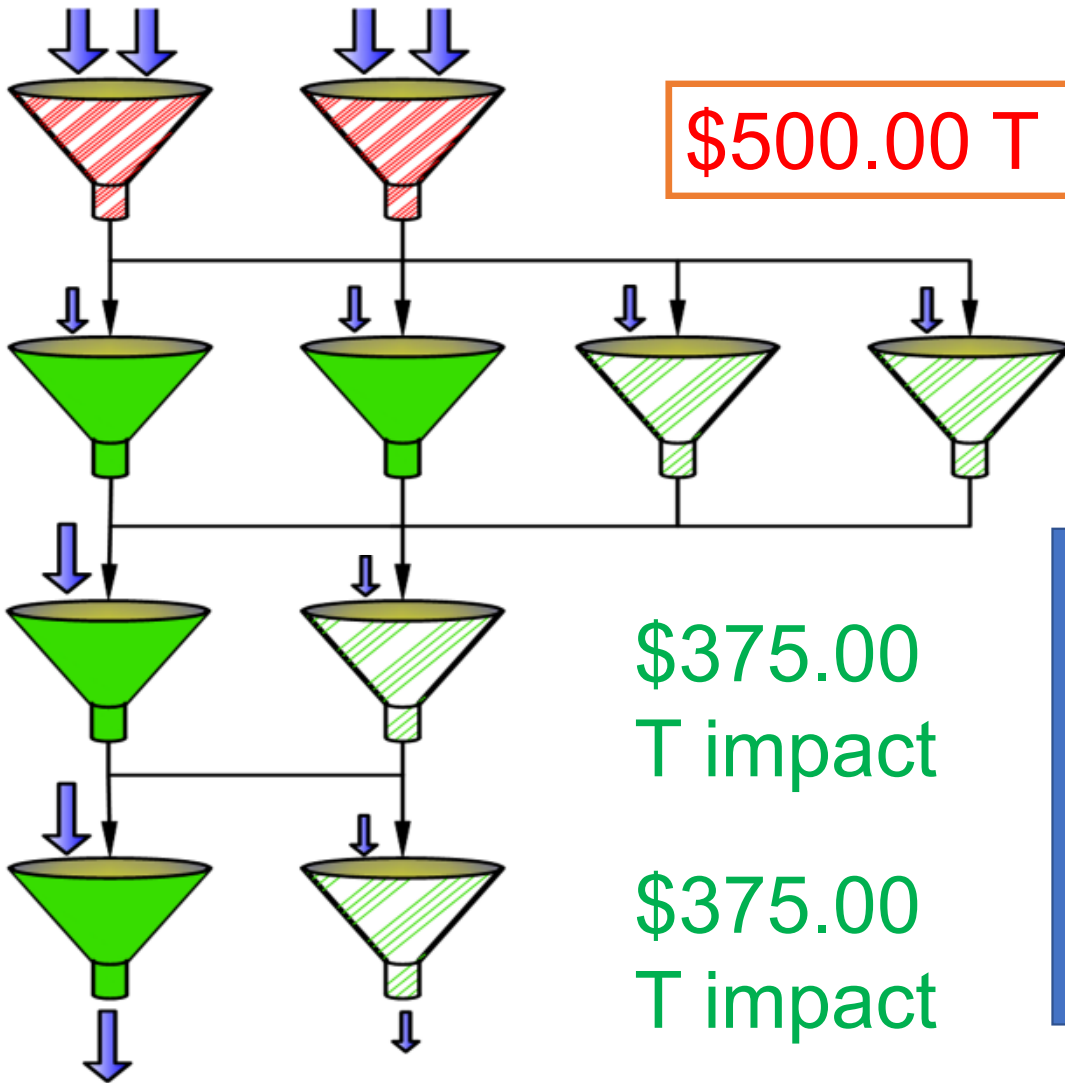
\$500.00 T impact

\$250.00 T impact

\$375.00
T impact

\$375.00
T impact

Note: All resources that are cross-hatched are the same resources doing multiple roles in the system.



Sources for additional information on TOC

- “The Goal: A Process of Ongoing Improvement” by Eliyahu Goldratt (Amazon)
- TOC-Goldratt www.toc-Goldratt.com
- CCPM Consulting www.ccpmconsulting.com
- Theory of Constraints Inst. www.tocinstitute.org
- Lean Production www.leanproduction.com/theoryof constraints.html

