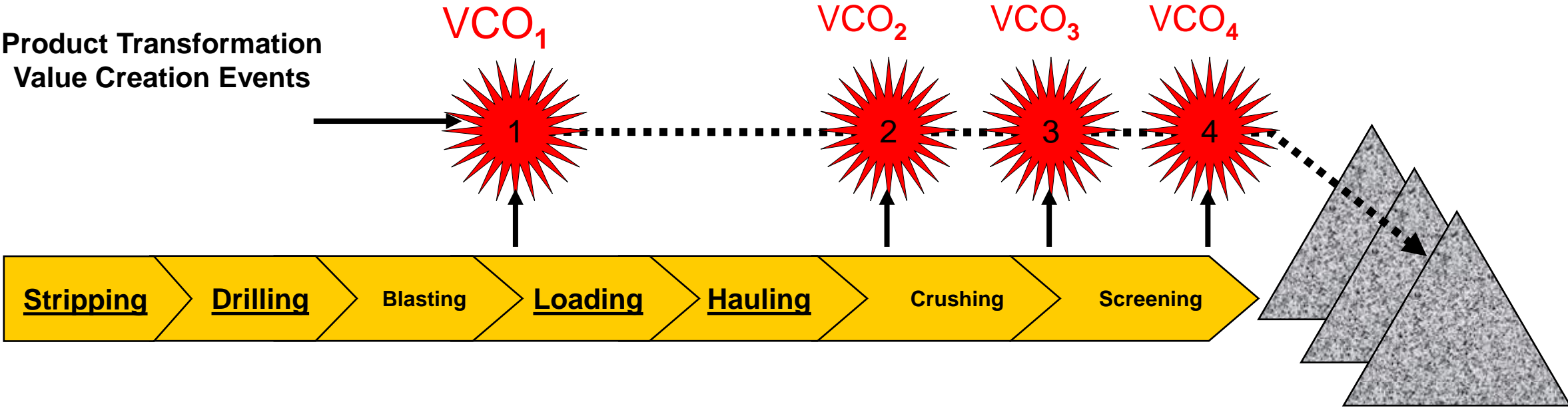


So do we eliminate the Non-Value Added Process

VCO = Value Creation Opportunity



Non-Value Adding activities

Value Adding activities



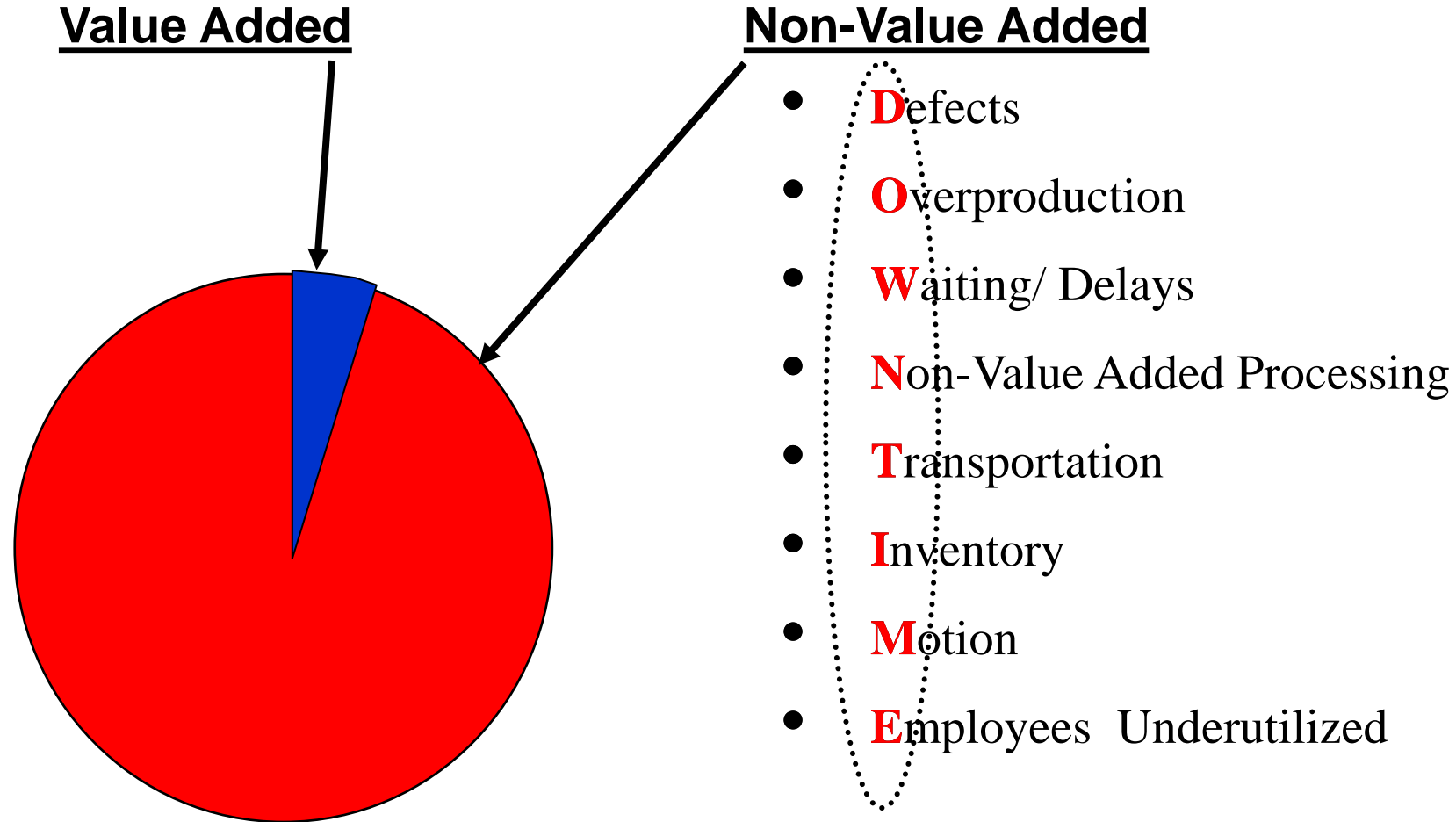
Lean Focus

Traditional Focus



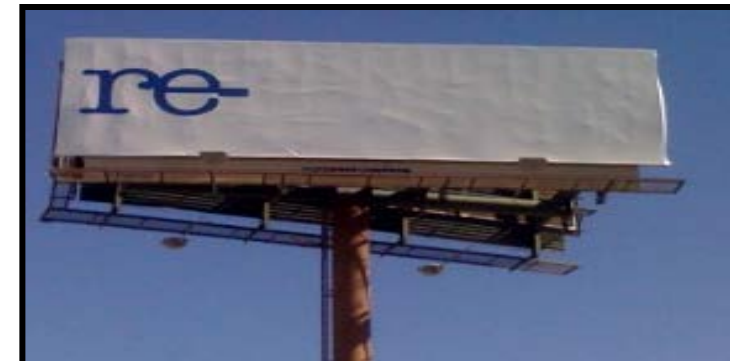
QUARRY ACADEMY

Lean = Eliminating the 8 Wastes



Defects

- **Definition: Anything that does not meet customer specifications or requirements**
 - ✓ **Form, fit or function**
 - ✓ **Timing/delivery**
- **Examples**
 - ✓ **Product out of specifications**
 - Oversized vs. Fines
 - Spec's Hardness or Durability
 - Lack of Cubicity
 - ✓ **Late Deliveries**
- **Causes**
 - ✓ **Variance! Variance! Variance! In:**
 - Processing methods
 - Equipment maintenance/set-up
 - Employee training/experience
 - Customer communication



Anything beginning with "Re"
(recirculate, return material, reissue,) is
a hint that you have defects!

Overproduction

- **Definition: Batch size more than 1 piece**
 - ✓ Making more than is required by the next process
 - ✓ Making it earlier...
 - ✓ Making it faster...
- **Examples**
 - ✓ Rock in the pit
- **Causes**
 - ✓ Large volume shots
 - ✓ Unbalanced workloads
 - ✓ Weather inhibits processing
 - ✓ “Keep busy” attitude!



Waiting/Delay Waste

- **Definition: To be stopped, detained, or hindered for a time**
- **Examples**
 - ✓ **Waiting for equipment**
 - ✓ **Waiting for parts, tools, supplies, etc.**
 - ✓ **Waiting for upstream operations**
 - Drilling
 - Blasting
 - ✓ **Waiting for clarification of instructions**
 - ✓ **Waiting on employees to show up**
- **Causes**
 - ✓ **Unbalanced work load and schedules**
 - ✓ **Unplanned maintenance and quality events**
 - ✓ **Not having the right tools or equipment**



Waiting/Delay Waste



Non-Value Added Processing

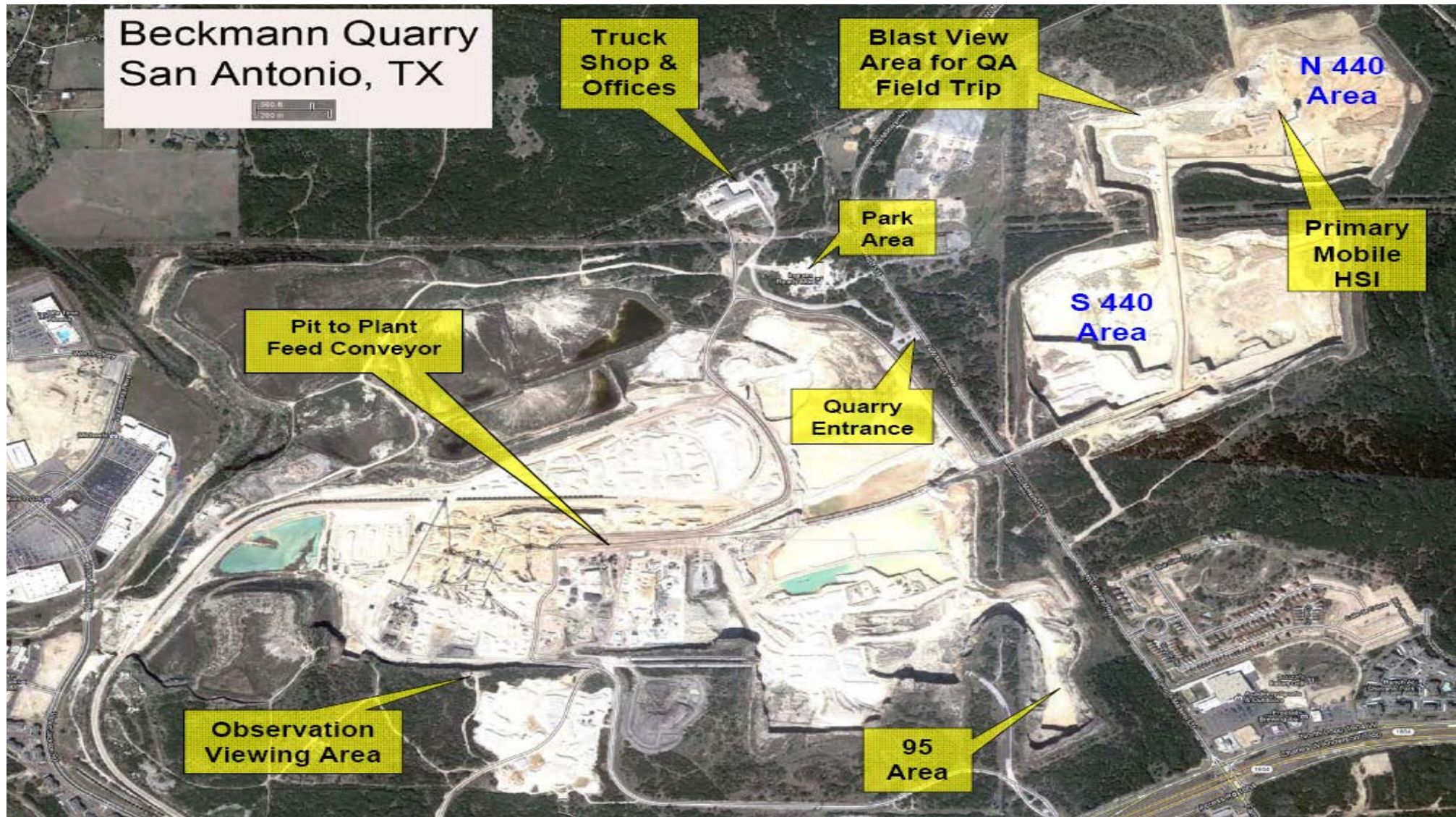
- **Definition: Effort that adds no value to the product or service from the customers' viewpoint**
- **Examples**
 - ✓ **Tolerances/specs beyond customer needs**
 - ✓ **“Extra” of anything – multiple screening**
 - ✓ **Unused records (collecting data that no one reads)**
 - ✓ **Multiple data entry on separate computer systems**
- **Causes**
 - ✓ **Change review looks at only one aspect – not the whole system**
 - ✓ **“Just-in-case” attitude**

Transportation Waste

- **Definition:** An act, process, or instance of transferring or conveying material from one place to another
- **Examples**
 - ✓ **Transporting rock, work-in-process and finished inventory around the pit**
- **Causes**
 - ✓ **Availability of customer specific raw material in the pit**
 - ✓ **Poor mine planning, flow not planned, just happened**
 - ✓ **Blasting deeper or further from crushing and sizing**



Beckmann Quarry



Inventory Waste

- **Definition: Any supply in excess of a one-piece**
- **Examples**
 - ✓ Finished Goods
 - ✓ Raw materials
 - ✓ Spare parts
- **Causes**
 - ✓ Byproduct sizes
 - ✓ Quality or yield problems
 - ✓ Poor forecasts
 - ✓ “Bulk quantity” pricing



Motion Waste

- **Definition: Any movement of people or equipment that does not add value to the product or service**
- **Examples**
 - ✓ Walking/driving to job sites
 - ✓ Looking for lost paperwork or work orders
 - ✓ Walking to get supplies or raw materials
- **Causes**
 - ✓ Inconsistent work methods
 - ✓ Poor workplace organization and housekeeping



Employees Underutilized

- **Definition: The waste of not using people's mental, creative, and physical abilities**
- **Examples**
 - ✓ Micromanaged employee
 - ✓ Untrained/ unskilled employee
- **Causes**
 - ✓ Low or no investment in training
 - ✓ Low pay, high turn-over strategy
 - ✓ Negative business culture



What is Waste

“**Anything other** than the minimum amount of equipment, materials, parts, space, and worker’s time which are absolutely necessary to add value to the product. – ADDS WASTE”

- Shoichiro Toyoda, President, Toyota

Waiting

Overproduction

Transportation

Inventory

Underutilized People

Motion

Defects

Non-Value Added Processing

Waste

- Waste only adds cost and time
- Waste is really a symptom rather than a root cause of the problem
- Waste points to problems within the system

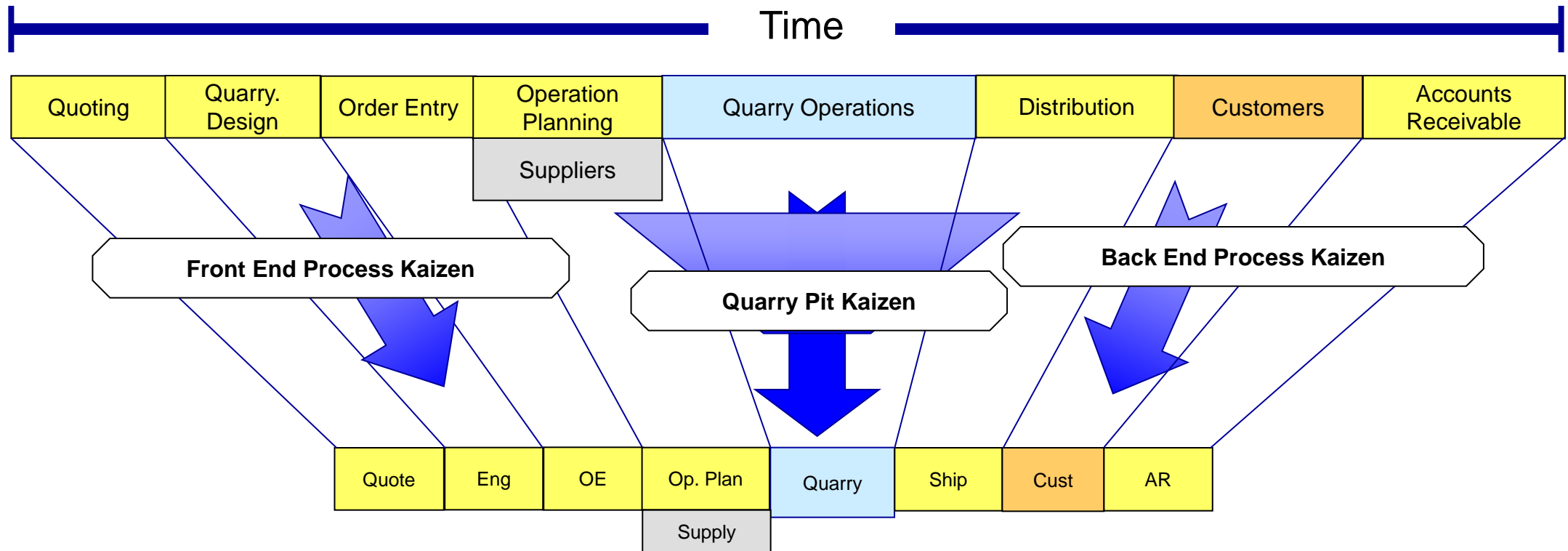


The Value Stream – Lean Thinking

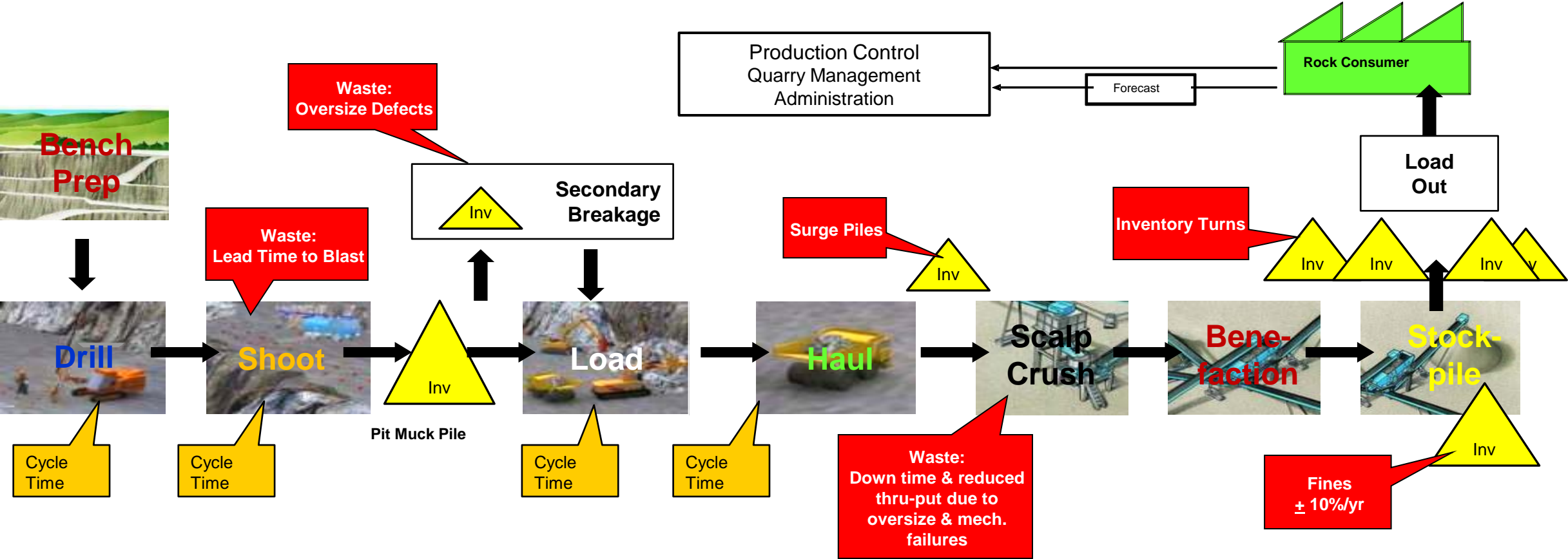


Measuring a the Entire Process

Efficiency -- Reducing Lead time across entire Value Stream

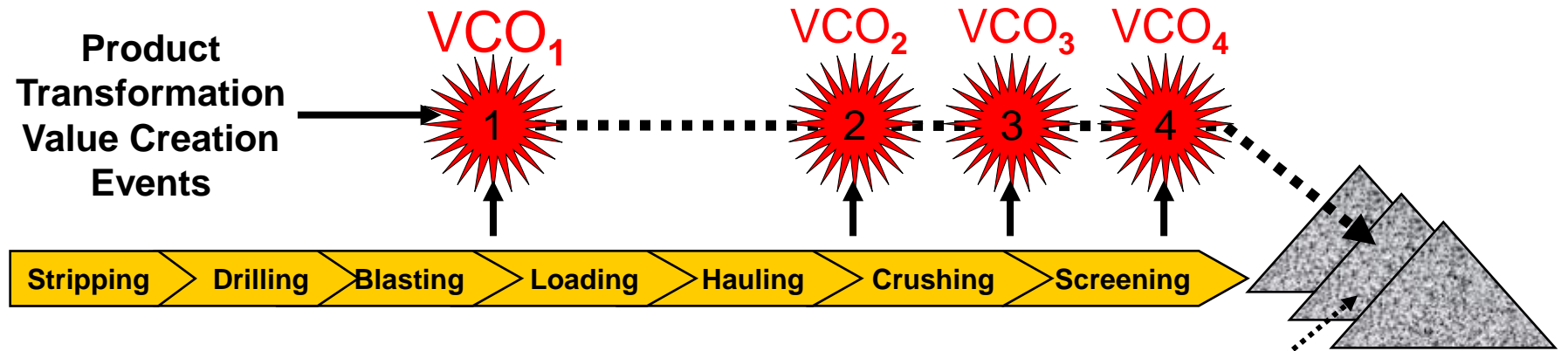


Quarry Operations – Rock Factory



Non-Value Added Activity

Lean Six Sigma in the Quarry Operation



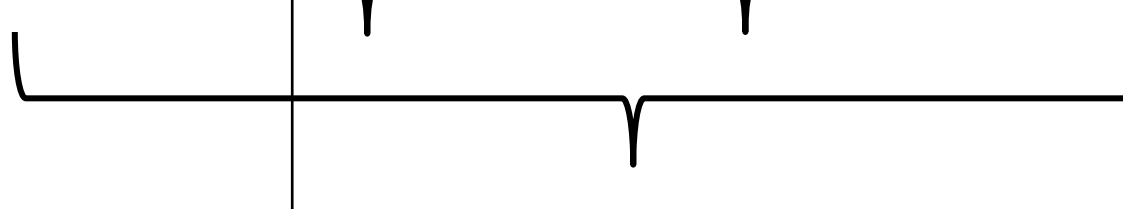
Point Lean =>



Six Sigma =>



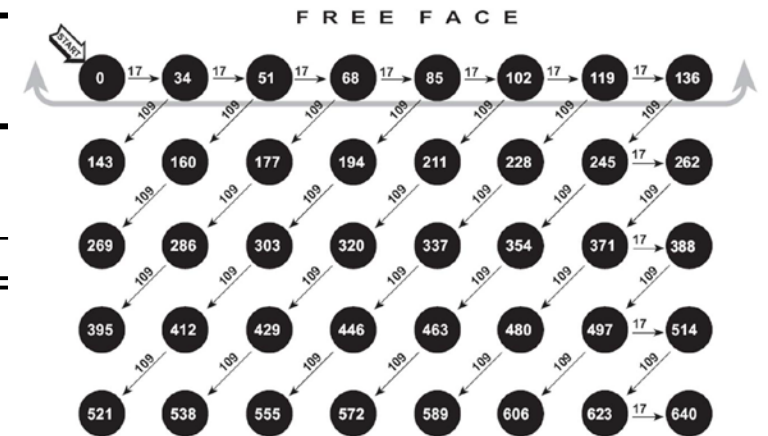
Enterprise Lean =>



VCO = Value Creation Opportunity

LAO =

SSO = Six Sigma Opportunity

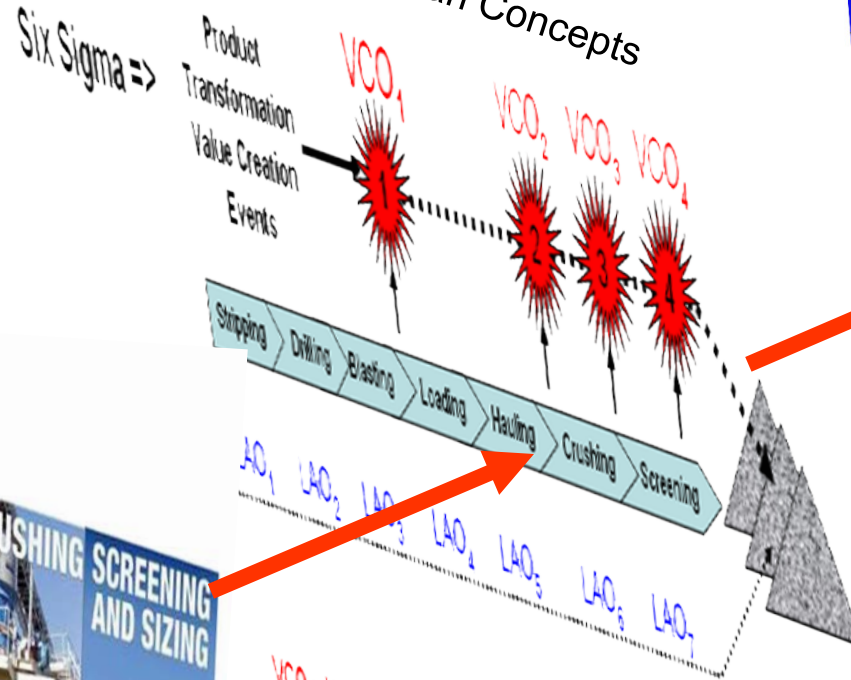


Shot Pattern Design

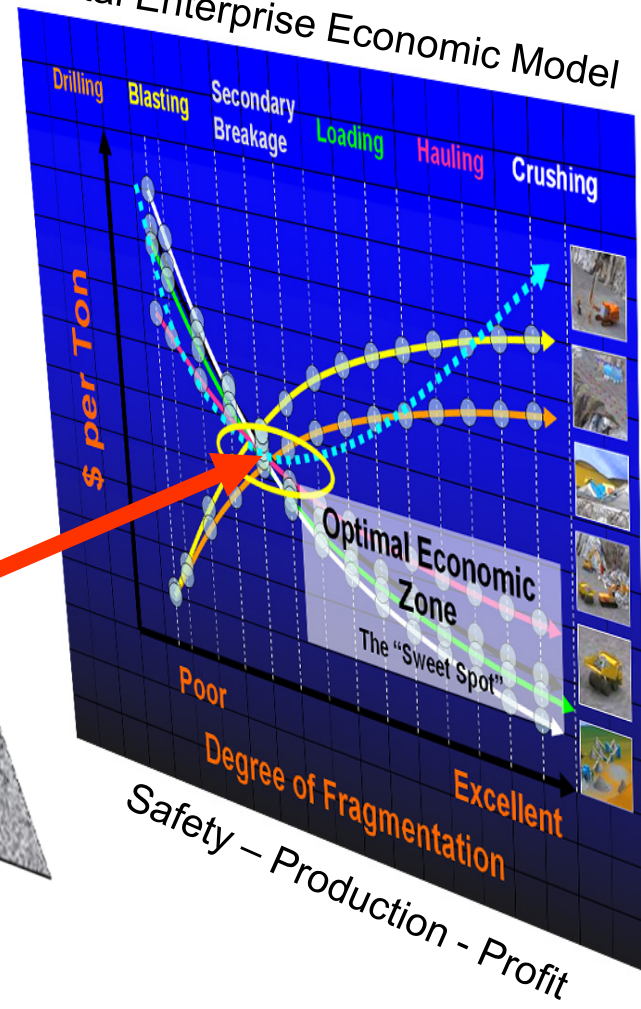
From Operations to Outcome:



6 Sigma Lean Concepts



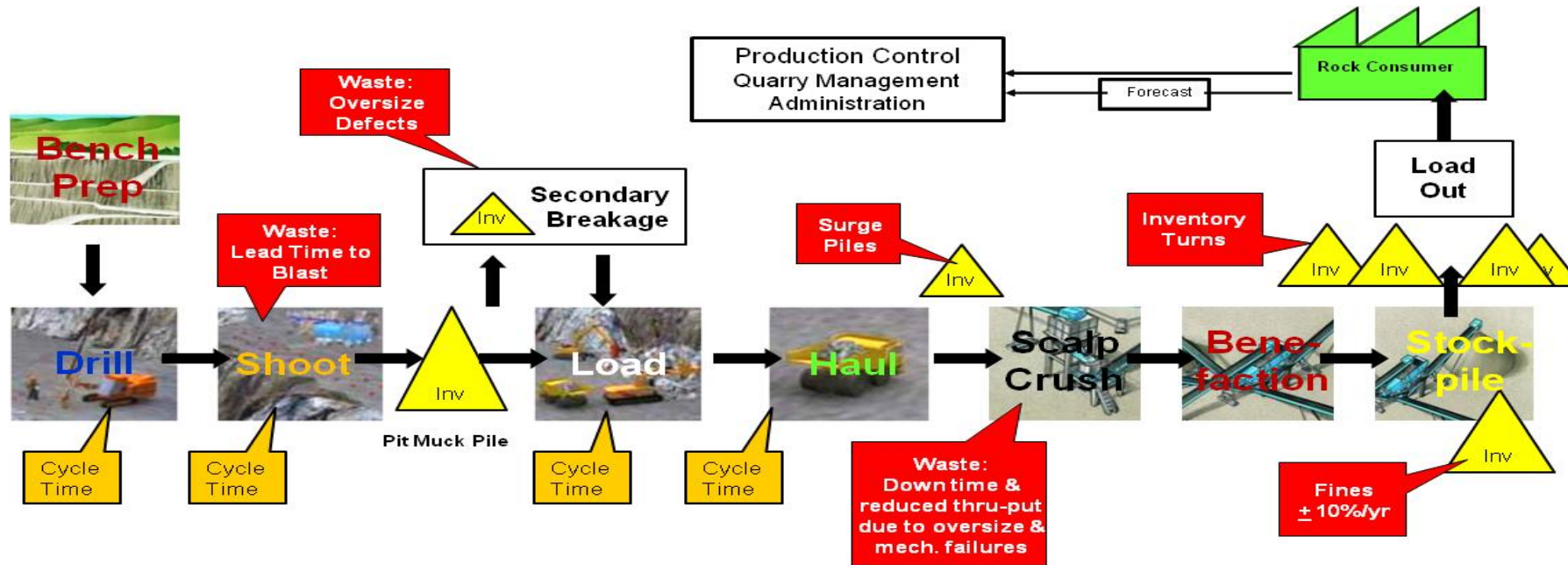
Total Enterprise Economic Model



VCO = Value Creation Opportunity
 LAO = Lean Activity Opportunity



The Value Stream / Rock Factory



PROCESS FLOW →



← **COMMUNICATION**

Get the Waste Out of the Process...

- Time
- Movement / Motion
- Inventory
- ✓ Over-Production
- ✓ Out of Spec Product
- ✓ Under-Production



<p>What we Want Less of:</p>	Set-up	Oversize	Fuel	OffSpecWear	Inventory
	Fuel	Fly Rock	Idling	Plug-ups	Wear
	Idling	Fines	Wear	Energy	Waste
	O'Drill	Vibration	Dig Cycle	Repairs	In-Process
	U'Drill	O'Break	U'Load		Energy

Lean is More Than Tools

- Value Stream Mapping
- Kaizen Teams
- Defect Prevention / Mistake Proofing
- Variation Reduction / Six Sigma
- 5s/Workplace Organization
- Visual Management
- Standardized Work / Methods Analysis
- Cellular / Flow Operations, Office, and Administration
- Constraints Management
- Generic Pull Systems Pull / Kanban Systems
- Set Up Reduction
- Total Productive Maintenance

Ultimately Must Result in a Change in Human Behavior

Cultural Characteristics

- **Holistic Approach to Process Improvement**
- **Kaizen – Continuously Driven**
- **Employee Based**
 - ✓ Top Down
 - ✓ Bottom Up
- **Environment of Empowerment but Driven by Process**
- **WIIFM – What's In It For Me**

What Kills Lean!

- **Command and Control Management**
- **Environment of Micromanagement**
- **Used for Workforce Reduction**

Paradigm Shift



Talking vs. Thinking
Technique vs. Culture
Bottom Line Metrics



Keys to Success

- Unyielding **leadership**
- **Strategic vision**, based on Lean Enterprise as part of company strategy
- **Involve** employees
- **Share** information and manage expectations
- **Identify and empower** champions, particularly operations managers
- Execute pilot projects **prior** to rolling out culture across organization
- **Foster** an atmosphere of experimentation
- **Install** realistic performance measurement, evaluation, and reward systems
- **Deep commitment** to excellence

An Alternative Solution





Questions?

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Lean Thinking

Learning to See

Andy and Me

Authors: Womack and Jones

Authors: Rother and Shook

Author: Pascal Dennis

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