SAFE AND LEAN
An Ergonomics Strategy in Truck Manufacturing
2018 YPSW Annual Meeting
Tom Slavin
Traffic Safety Word Association

What comes to mind when you think of “traffic safety”? 
Traffic Safety – Another View

• What is the safest way to travel across the country in your car?
• Would you choose the route with...
  • Most stop lights
  • Lowest speed limits
  • Poorest cell phone reception
  • Most “dry” counties
• Or...
Expressway

- But ... is this a Safety measure?
Safety Insight (from a while ago)

**Principle 1:**

*Efficient Automotive Transportation, not accident reduction, is the fundamental problem.*

Accidents, like congestion, are only indices of inefficiency.

- Traffic Accidents and Congestion

  --Maxwell Halsey, 1941
Stoplights and Speed Limits: Lessons

• The best safety solutions add value
• EHS professionals do not have a monopoly on safety ideas
• Safety problems are often business problems
• Best results come when everyone is engaged
What Is LEAN????
(No standard Definition)

• Deliver Value Fast;
• Eliminate Waste

• When you do LEAN right you also get CLEAN and SAFE
THE 8 WASTES

- Defects
- Overproduction
- Waiting
- Non-Utilized Resources
- Transportation
- Inventory
- Motion
- Excess Processing

95%
### Defects

| Production defects and service errors waste resources in 4 ways: Material is consumed, cost needed to produce part, rework and labor to address possible coming complaints | Defects require repairs to be made out of station which introduces the possibility for injuries. Defects can be associated with sharp metal, and unstable stacking. |

**Safety Impact**

**REPAIRS OFF LINE**

![Image of people working on a truck]
<table>
<thead>
<tr>
<th><strong>Overproduction</strong></th>
<th><strong>Safety Impact</strong></th>
</tr>
</thead>
</table>
| It is caused when more goods are produced than necessary or by producing faster than needed.  
<em>e.i. Internal stampings, over shipments, sub assemblies</em> | Overproduction indicates that workers may be working faster than necessary, which can increase the risk of a repetitive strain injury. Also, housekeeping, tripping, crowding, falling parts. |
When materials and processes are poorly coordinated, materials must be handled multiple times—loading and unloading, storing and retrieving. Loading and unloading increases the risk of a repetitive strain injury. Forklift traffic creates the potential for damage and injury.
### Excess Inventory

This refers to inventory that sits between operations or that is delivered by internal/external suppliers before requirement, using valuable floor space (WIP & Warehouse) and risk of damaging material.

### Safety Impact

Excess inventory between operations due to large lot production or supplier packaging increases the risk of trip hazards, distractions, blind spots for pedestrians and fork lifts and material handling injuries.
### Excess Motion

<table>
<thead>
<tr>
<th>BEFORE CONDITION</th>
<th>AFTER CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is any movement by a worker or machine which is not necessary for the production process, bending to reach parts, long walking distance to reach parts, lift heavy parts, etc.</td>
<td>Storing tools / parts outside of the work station requires additional effort such as walking, bending, carrying, thus presents an opportunity for injuries.</td>
</tr>
</tbody>
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**Safety Impact**
KAIZEN “Door Glass Area” - Excess Motion

BEFORE CONDITION:

AFTER CONDITION
Assembly Line example:
Reduces excess inventory, excess motion, cycle time.

Small lot packaging reduces weight.

Inclined racks make parts accessible and allow rear loading.

Easy access reduces bending, walking and cycle time.
**Excess Processing**

- It is caused when more work is done than necessary or more operations are performed than needed.
- *e.g.* scrap allowed to get wet and must be dried; sprue design requires cut off

**Safety Impact**

Excess processing requires more force than needed to remove sprues leading to strains; excess gas used to cure cores leads to exposures of TEA, formaldehyde, etc.

Sprue removal
5S is a philosophy that focuses on workplace organization, cleanliness and standardization of work procedures. It is the foundation for lean strategies.

- **Sort:** Keep only what is needed
- **Set in order:** A place for everything & everything in its place
- **Shine:** Cleaning the Workplace-Housekeeping
- **Standardize:** Maintain the 1st, the 2nd and 3rd Ss
- **Sustain:** Maintain Workplace Organization.

5S is intended to simplify the workplace environment by making “out of standard” conditions readily visible, identifies waste and non-value activity while improving quality, efficiency and safety.
5S FOR THE WORKPLACE

Unnecessary Items at Shop floor
5S FOR THE WORKPLACE

Safety Hazards from cluttering and stacking.
5S FOR THE WORKPLACE

A Place for everything & everything in its place
5S FOR THE WORKPLACE

A Place for everything & everything in it's place
5S FOR THE WORKPLACE

A Place for everything & everything in its place

BEFORE CONDITION:

AFTER CONDITION
5S FOR THE WORKPLACE

A Place for everything & everything in it's place
Mistake-Proofing “POKA-YOKE”

POKA-YOKE: Japanese term for 'mistake-proofing'.

Making it impossible for parts, tooling, equipment and fixtures to be used improperly preventing defects and safety incidents from occurring.
**Mistake-Proofing “To err is human”**

What if you had to write your name 1500 times everyday

*With all of life’s distractions…..*

Are you 100% sure that you would never make a mistake?

Have you ever done the following:

- Driven to work and not remembered it?
- Driven from work to home when you meant to stop at a store?

It happens to all of us.
POKA-YOKE Mistake-Proofing Techniques

- **Built-in mistake proofing**

  Designed for Manufacturability (DFM)

- **Designed for Manufacturability (DFM)**

  Designed devices or inspections techniques to assure no mistakes

  Designs that cannot be manufactured or assembled incorrectly. This technique can also be used to “Simplify” the design and therefore reduce cost
Mistake-Proofing examples around us
**Mistake-Proofing “POKA-YOKE”**

- Things done right 99.9% of the time means.....
- Two unsafe landings at O’Hare Chicago airport each day
- 16,000 lost pieces of mail per hour
- 20,000 incorrect drugs prescriptions per year
- 22,000 checks per hour deducted from wrong accounts
- 500 incorrect surgical operations per week

Why mistake-proof is an important lean tool?

- Prevents possible injuries (Safety)
- Improves process efficiencies and resources (Waste elimination)
- Allows Zero Defects Quality (ZDQ)
- Increases business profitability (Cost)
- Improves Customer Satisfaction (Quality)
Mistake-Proofing “POKA-YOKE”

Parts bin synchronized to tool and process sequence so correct bolt must be selected
The intent of visual management is that any abnormalities can easily be identified such as:

- Material out of location
- Equipment & tooling out of location
- Performance information levels
- Excess / shortage of material
- Ergonomic issues
- Identify safety hazards
- Visual poke yokes

The human brain responds **55%** to visual instructions, **32%** to vocal and **13%** to written instructions.
### VISUAL TEST “WORDS”

<table>
<thead>
<tr>
<th>Castrol</th>
<th>Chevron</th>
<th>Chilis</th>
<th>Cirrus</th>
<th>MSNBC</th>
<th>Colgate</th>
<th>Comfort</th>
<th>Coors Light</th>
<th>Corona</th>
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<tr>
<td>DQ</td>
<td>Daytona</td>
<td>Dell</td>
<td>Denny’s</td>
<td>DHL</td>
<td>Directv</td>
<td>Domino’s</td>
<td>ESPN</td>
<td>Hooters</td>
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<td>ESSO</td>
<td>FedEx</td>
<td>Finlandia</td>
<td>Firestone</td>
<td>Flowmaster</td>
<td>Gatorade</td>
<td>Hanes</td>
<td>Lays</td>
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<td>Goodyear</td>
<td>Holiday Inn</td>
<td>Total Home</td>
<td>Hooters</td>
<td>Hot wheels</td>
<td>IKEA</td>
<td>Kit Kat</td>
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<tr>
<td>Lipton</td>
<td>Mercedes</td>
<td>Mobil</td>
<td>Old Navy</td>
<td>Texaco</td>
<td>STP</td>
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<td>Pepsi</td>
<td>MasterCard</td>
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<td>Rxmax</td>
<td>Texaco</td>
<td>Valvoline</td>
<td>Taco Bell</td>
<td>Tic Tac</td>
<td>Tropicana</td>
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<td>Kmart</td>
<td>Kodak</td>
<td>Kool-Aid</td>
<td>Land Rover</td>
<td>Nasa</td>
<td>Nintendo</td>
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</table>
VISUALS AT OUR FACILITIES

- Kanban
- Mailboxes at assembly line
- Visuals for pipe color coding
- Rack content list
VISUALS AT OUR FACILITIES
STANDARDIZED WORK

“There is no kaizen without standardization”
Taiichi Ohno

Standardization is the way to sustain the kaizen Gains

Without standardization, all my improvements will roll back with time

Standardization is a tool that will ensure your improvements will be sustained.
STANDARDIZED WORK

Is the way to sustain the kaizen Gains

Standardization:

- Will make Improvements consistent
- Will make results predictable
- Will ensure improvements stay in place
- Will allow a continuous improvement instead of repetitive one

Without standardization:

- Improvements are inconsistent
- Results are unpredictable
- Gains are not sustained
- Improvements become repetitive
STANDARDIZED WORK

By standardizing the method, we standardized good ergonomics. Where there are no standard methods, the operators will each develop their own which may, or may not, be the safest way to do the job.

Standardizing the right motions reduces the chance of repetitive motion injury. And paying attention to why unusual motions are necessary comes back to reducing variation and overload in the workplace.

Something to remember about Standardized Work

“The right process produces the right result”
SMALL LOT PACKAGING

Determining, assigning or designing the appropriate standard pack and container that minimizes size and lot quantity for each part.

The purpose is to provide parts to the operator in a user-friendly container that facilitates damage-free and economical/ergonomically handling during shipment, storage and delivery.
Small Lot Packaging

Pack Quantity = 785 Pieces
Daily Requirements (Average)= 80 pieces
Days of inventory at Line Side = 9.8 Days

Small lot packaging will result in less fork lifts required, less propane, reduce working capital, improve material flow/presentation, safety working conditions, etc.
Small Lot Packaging

Lower Levels Of Inventory Expose Problems

“A Sea of WIP”

“Now You See It!”
LEAN done wrong or right

**Bad Lean**
- “less employees are needed”
- Do more with less
- Increase stress due to demands
- No time to talk to customers
- Impersonal
- Remove guards for speed

**Good Lean**
- Employee contributions are valued
- Efficient process
- Decrease stress, no parts shortages
- Focus on customer needs and value
- Better communication
- 5S everything in its place
Introduction of Ergonomics at Navistar – A Little Background

• Labor contract negotiations – safety subcommittee
• Big Three had agreed to form ergonomics committees
• Ergonomics language looked like a win-win
“Ergonomics is too important for health and safety.”

---COMPANY PRESIDENT
Health and Safety Approach to Ergonomics

- Programs
- Committees
- Focus on Force, Frequency and Posture
- (Stop signs and speed limits)
“Ergonomics is too important”: Lessons for EHS

• Designed in safety is not the same as designed by safety
• EHS must get out of the way of EHS
• EHS is better at supporting than controlling
THANK YOU!