

Sep. 12-13, 2017

4<sup>th</sup> CCPS GLOBAL SUMMIT ON PROCESS SAFETY IN OKAYAMA

# Striving for Perpetual Safety

## - Enhancement of Safety Culture by Improvement of Operational Discipline

恒久的安全を目指して

- 職務規律の改善による安全文化の強化

**DuPont-Mitsui Polychemicals Co., Ltd.**  
**Tokyo, Japan**

三井・デュポン ポリケミカル株式会社

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## 2. Perpetual Safety Process

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*DuPont-Mitsui Polychemicals is a joint venture between DuPont and Mitsui Chemicals founded 57 years ago. (The oldest DuPont's JV in Japan)*

**Founding:** December, 1960  
**Shareholders:** Mitsui Chemicals 50%  
DuPont K. K. 50%  
**# Employees:** about 280  
**Capital:** 6.48 billion yen

## Otake Plant

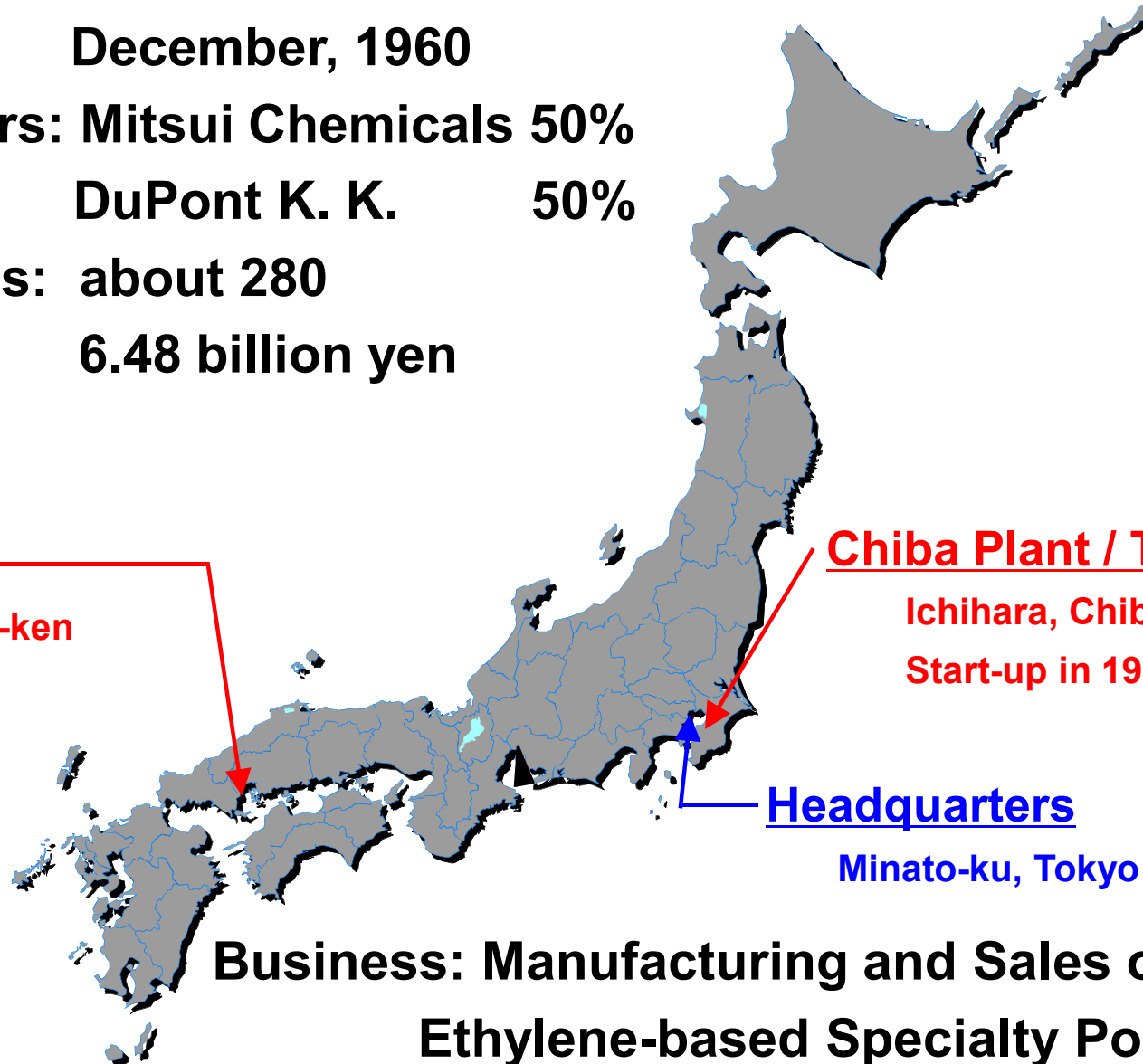
Otake, Hiroshima-ken  
Start-up in 1962

## Chiba Plant / Technical Center

Ichihara, Chiba-ken  
Start-up in 1967

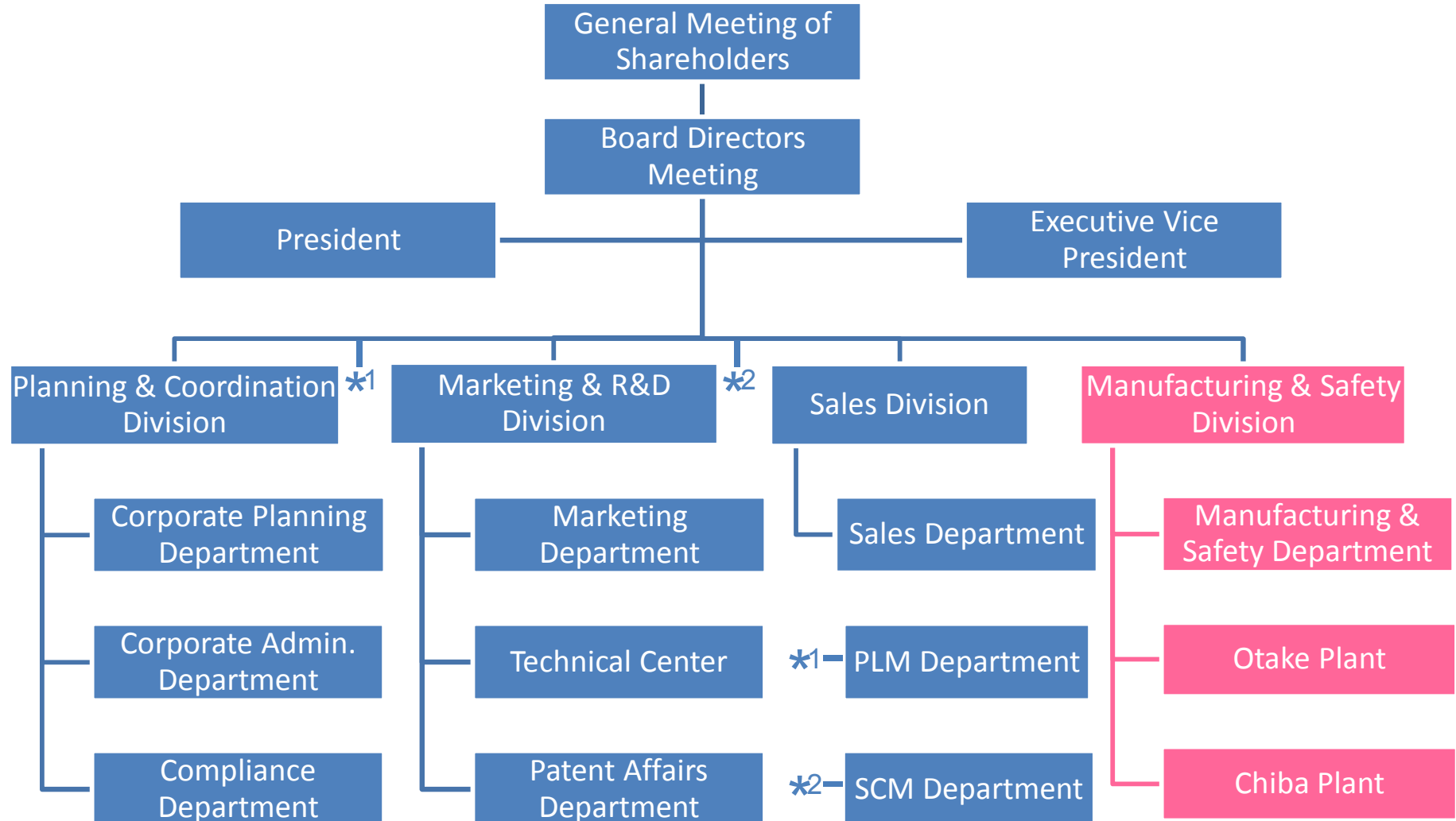
## Headquarters

Minato-ku, Tokyo

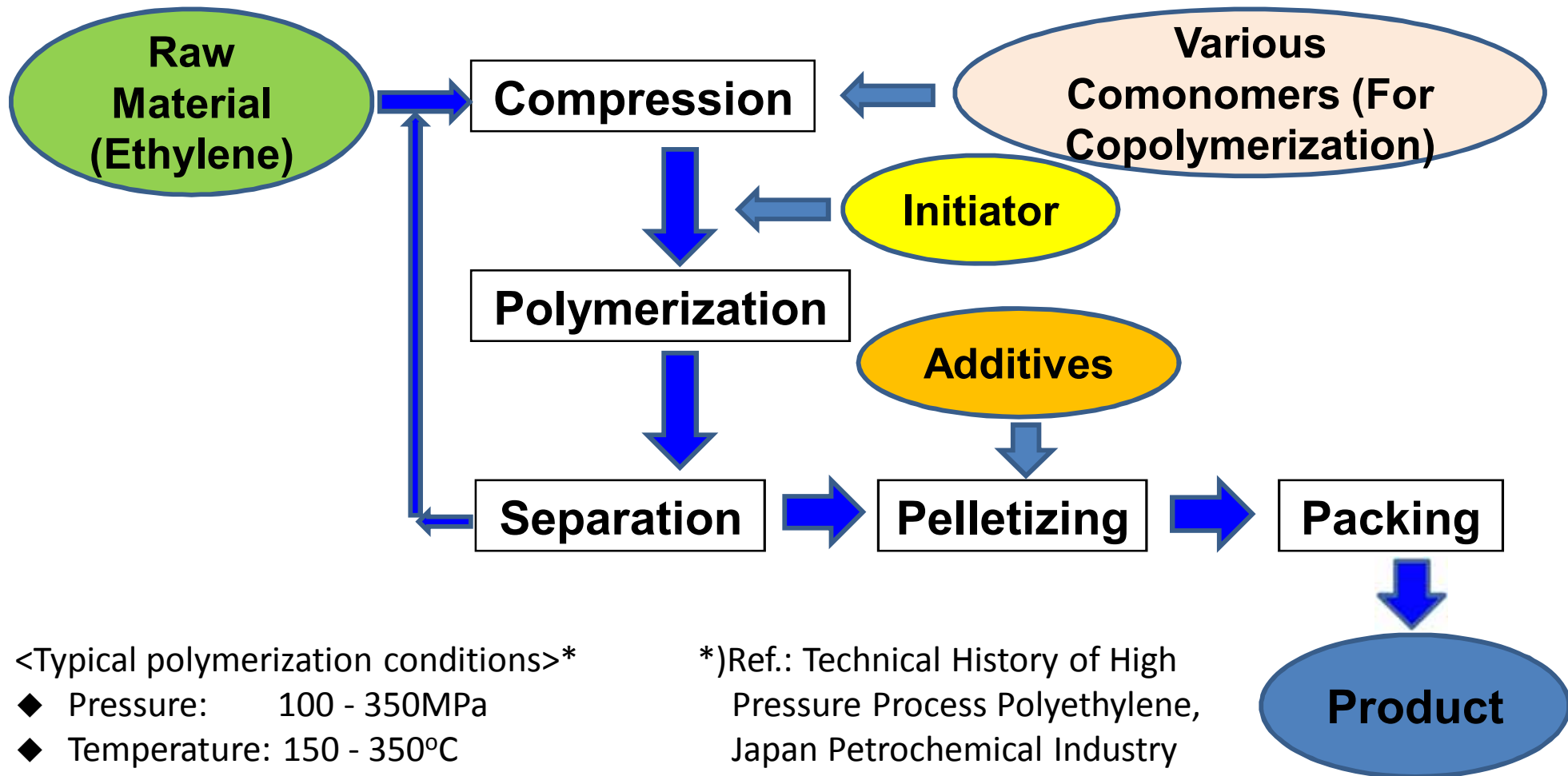


**Business: Manufacturing and Sales of  
Ethylene-based Specialty Polymers**

*The Manufacturing & Safety Division consists of the Manufacturing & Safety Department at Tokyo Headquarters and two plants in Otake and Ichihara.*



*The ultra-high pressure polymerization process requires to control enormous energy adequately for safe and stable operation.*



<Typical polymerization conditions>\*

- ◆ Pressure: 100 - 350MPa
- ◆ Temperature: 150 - 350°C
- ◆ Initiator: Organic peroxides, O<sub>2</sub>
- ◆ Conversion: 10 - 30%

\*)Ref.: Technical History of High Pressure Process Polyethylene, Japan Petrochemical Industry Association,1998. 3, P2-P5

*DuPont-Mitsui Polychemicals produces a variety of ethylene-based specialty polymers.*



Product Name	Polymer Type	Manufacturing Plant	
		Otake	Chiba
<b>Evaflex™</b>	Ethylene Vinyl Acetate Copolymers		✓
<b>Himilan™</b>	Ionomer Resins	✓	
<b>Nucrel™</b>	Ethylene Methacrylic Acid Copolymers	✓	
<b>Entira™ Antistat</b>	Lasting Anti-static Polymer Additives	✓	
<b>CMPS™</b>	Lidding Sealant Resins		✓
<b>Mirason™</b>	Low-density Polyethylene	✓	✓

“Evaflex”, “Himilan”, “CMPS”, and “Mirason” are trademarks of DuPont-Mitsui Polychemicals and they are registered in Japan.

“Nucrel” and “Entira” are trademarks of E. I. DuPont.

*Evaflex™, Ethylene vinyl acetate copolymers or EVA, is used for ...*



## **Solar Module Sealant**

Evaflex's superior pliability and transparency make it ideal for this use.

### Features

- Transparency
- Flexibility
- Elasticity
- Adhesiveness



## **Electric Wire Covering**

Evaflex's flexibility and its compatibility with inorganic fillers are employed in this use.



*Himilan™, Ionomer resins, is used for ...*



## **Golf Ball Cover**

Thanks to its excellent elasticity and cut resistance, Himilan is widely used for golf ball covers.

- Features
- Transparency
  - Oil resistance
  - Stress crack resistance



## **Cosmetic Container (Decorative Cap)**

Due to its luster and excellent transparency, Himilan is used for containers and the like.

- Toughness
- Adhesiveness to metal
- Heat sealability
- Hot tack

*Nucrel™, Ethylene methacrylic acid copolymers or EMAA, is used for ...*



## Food Packaging

Thanks to its adhesiveness to metal and hot tack, Nucrel is used in a wide-variety of food packaging materials.

- Features
- Heat sealability
  - Hot tack
  - Adhesiveness to metal



## Liquor Carton, Beverage Containers

Nucrel's adhesiveness to metal, heat stability, and chemical resistance to its contents make it ideal for these uses..

- Thermostability
- Chemical resistance

*DuPont-Mitsui Polychemicals has the longest record with employee no lost workday case in the Japanese petrochemical industry.*

## Employee no lost workday case record (as of July 31, 2017)

### Otake Plant

- 16,013 days (about 43.9 years)
  - Last incident day: September 27, 1973
- **Continuing the longest record among 56 manufacturing sites belong to the Japan Petrochemical Industry Association.**

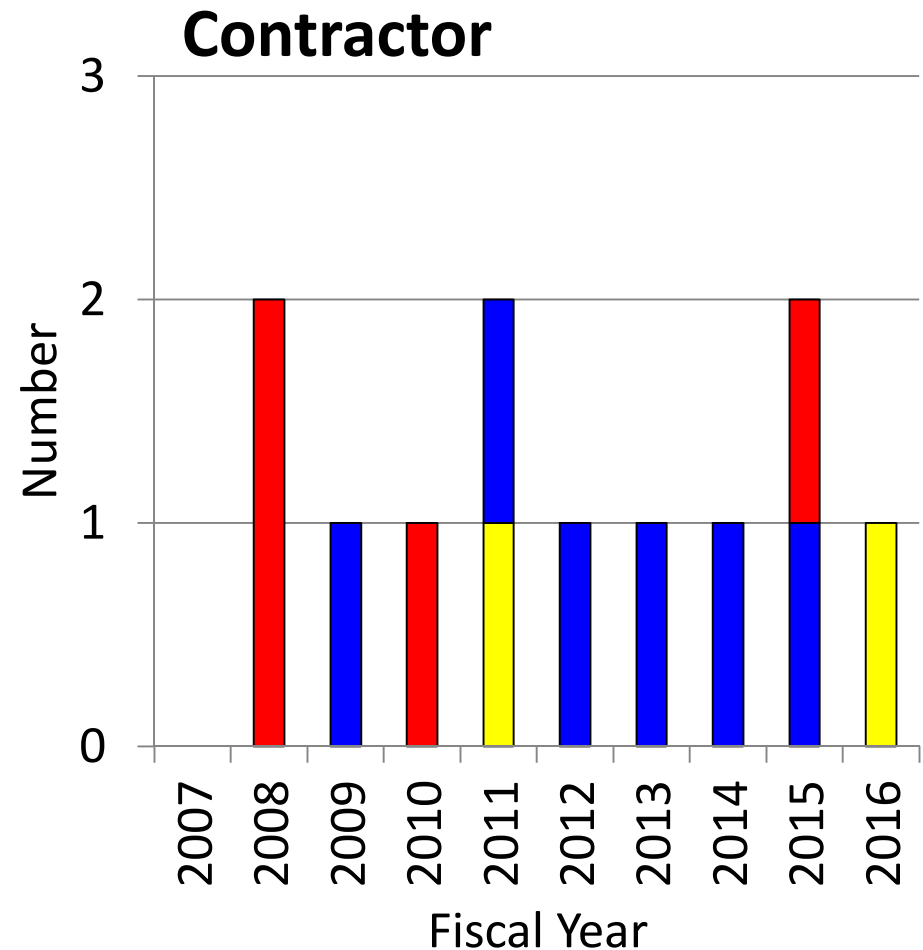
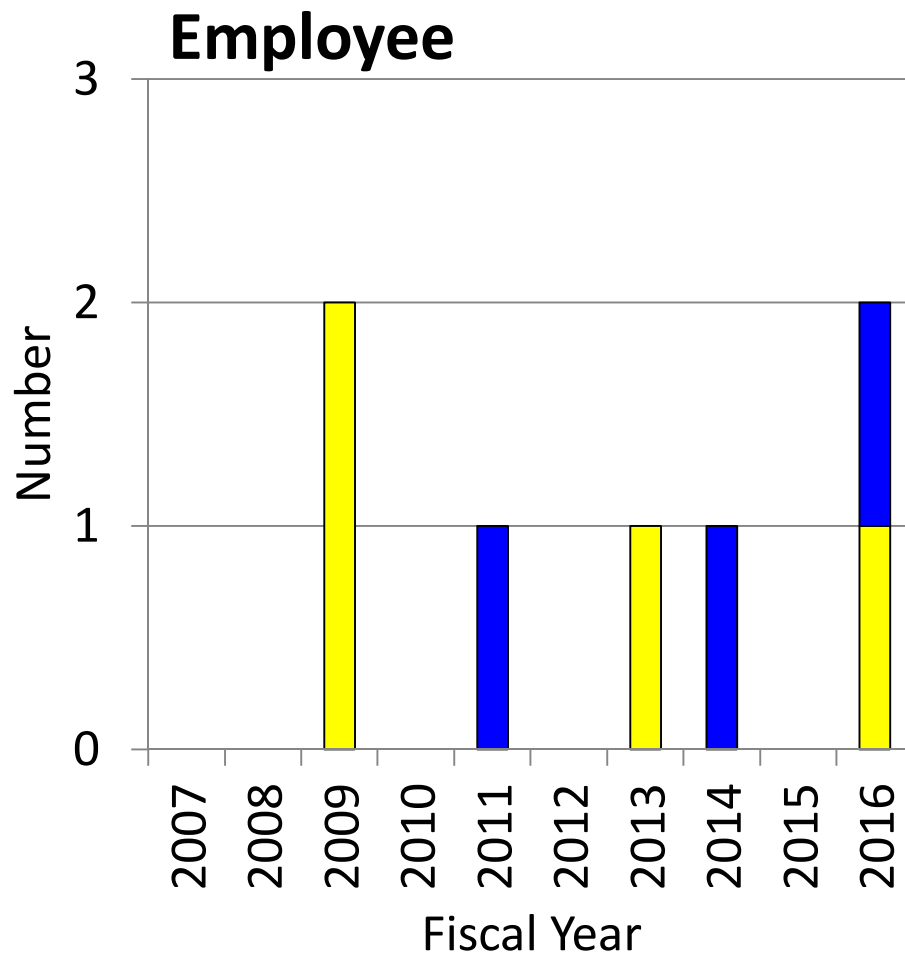
### Chiba Plant

- 8,110 days (about 22.2 years)
  - Last incident day: May 18, 1995
- **Ranked as the ninth longest as an ongoing record among the above-mentioned sites.**

*Recordable injuries of employees are decreasing.  
However, serious injuries of contractors are still occurring.*

## Injury record (2007- 2016)

- LWC: Lost Workday Case
- RWC: Restricted Workday Case
- MTC: Medical Treatment Case



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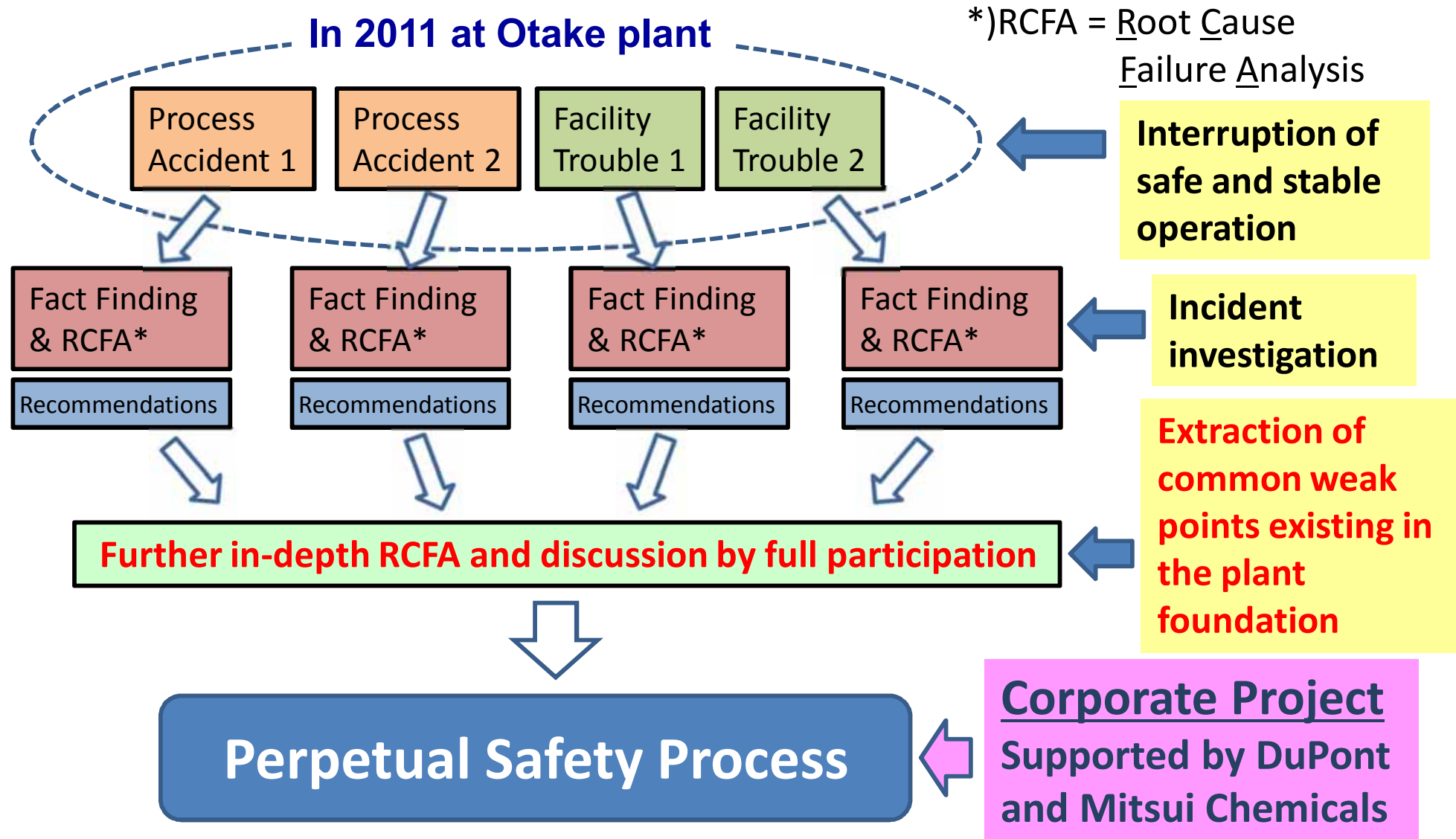
## 2. Perpetual Safety Process

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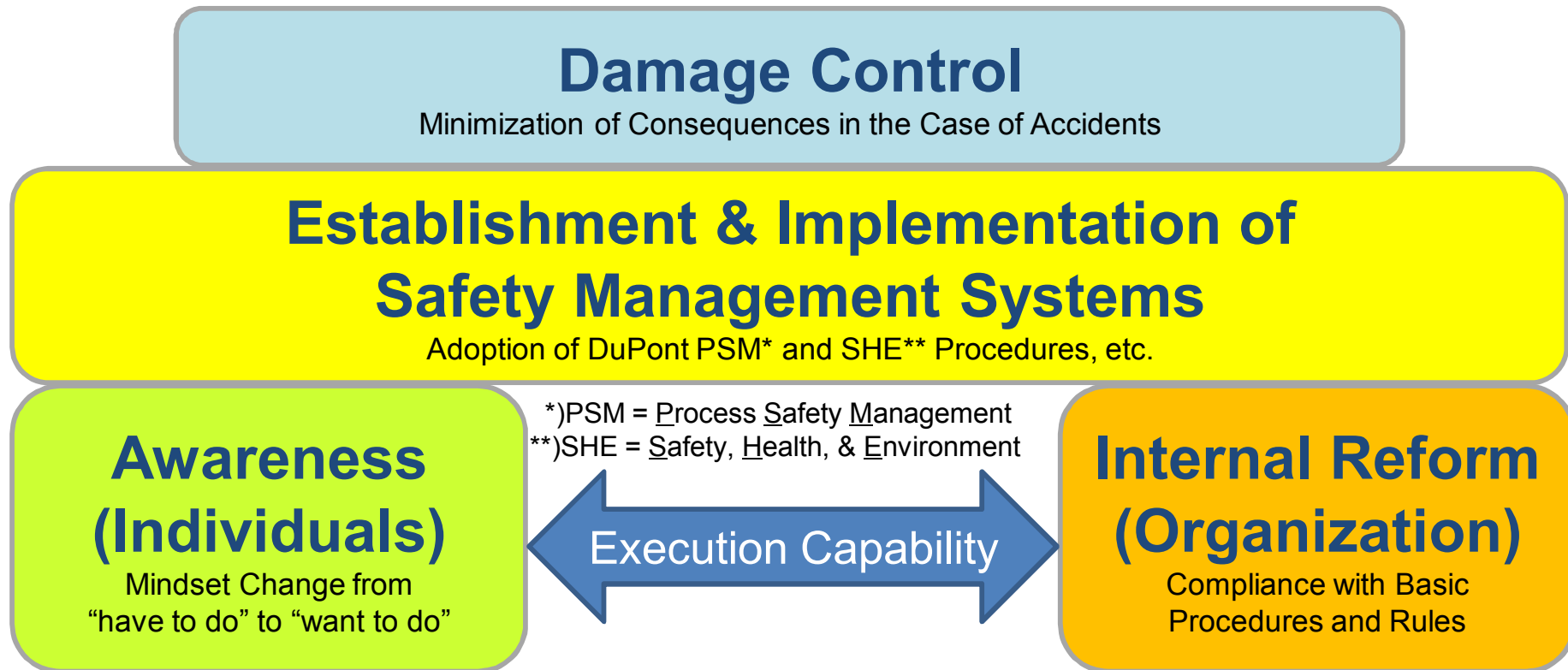
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*“Rebuilding Plan for Perpetual Safety” was established as a corporate project after a series of accidents and troubles occurred at Otake plant in 2011.*

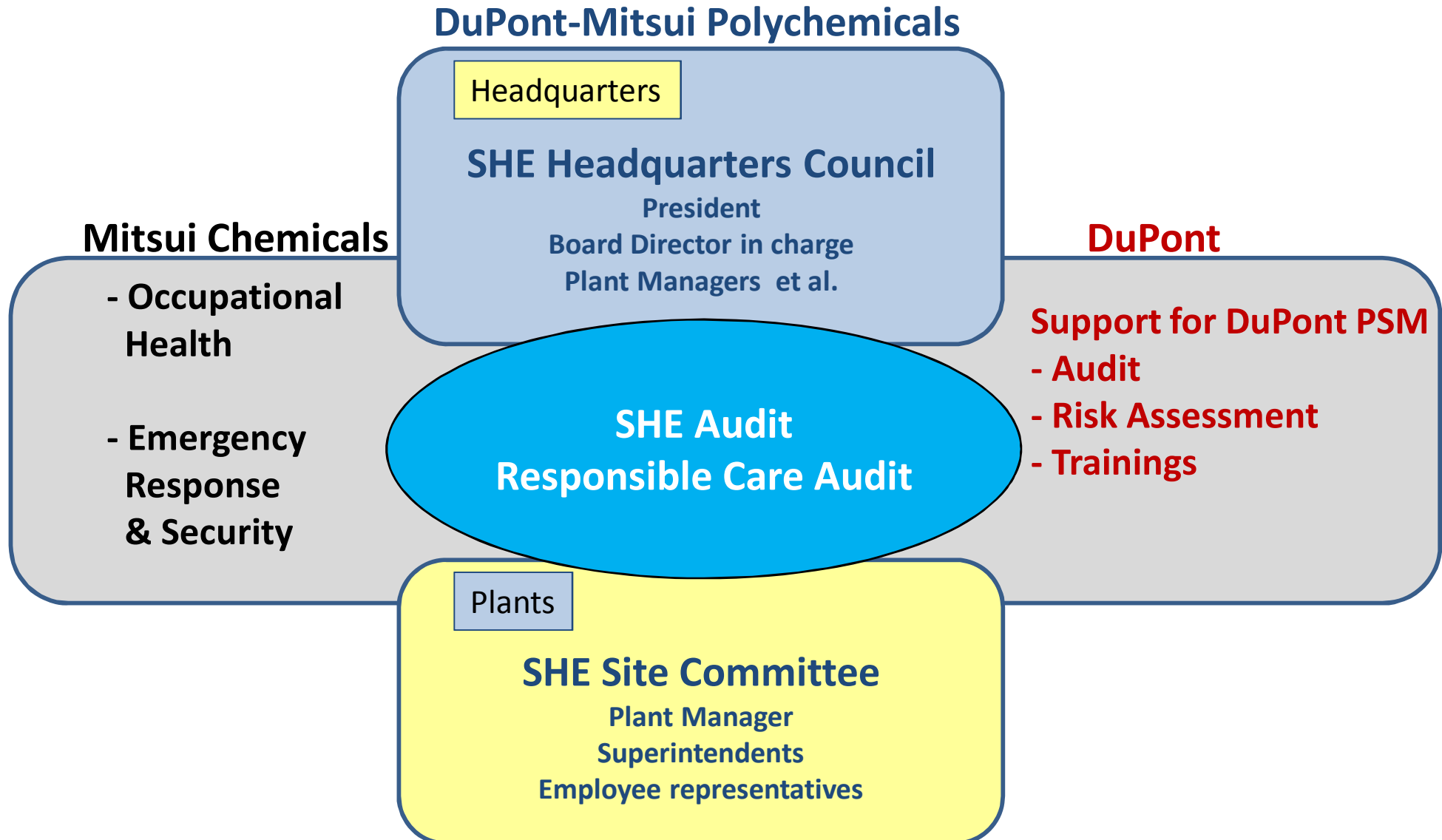


*Perpetual Safety Process consists of 4 segments, system, individuals, organization, and damage control, which are correlated each other.*



**Goal: Regain our company's credibility from society, customers, shareholders and employees.**

*Perpetual Safety Process is promoted by internal management system, while getting strong support from both parent companies.*





*Activities for Perpetual Safety Process are based on DuPont PSM system.*

**DuPont Process Safety Management, or DuPont PSM, is an integrated management system to control the risks involving fires, explosions, chemical reactions, and releases of energy to prevent catastrophic incidents that can impact;**

- ◆ **Employees and contractors**
- ◆ **Community**
- ◆ **Environment**
- ◆ **Business (Customers)**
- ◆ **Shareholders**

**DuPont PSM focuses on providing sufficient controls and/or redundancies to avoid a set of conditions which can lead to loss of containment of hazardous substances.**

*DuPont PSM is composed of 14 elements grouped by Technology, Personnel, and Facilities. They work as “spokes” to drive the wheel model.*



**Center of wheel:**  
Management Leadership & Commitment for implementing PSM programs

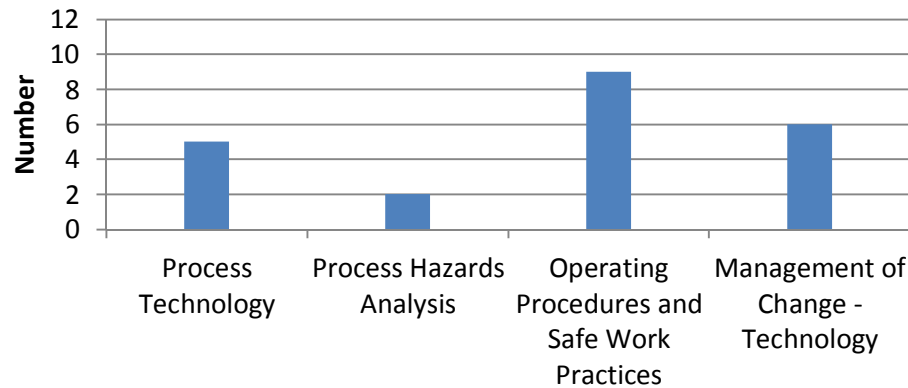
**Spokes:** 14 PSM elements grouped by Technology, Personnel, and Facilities

**Rim:** Operating Excellence achieved through Operational Discipline

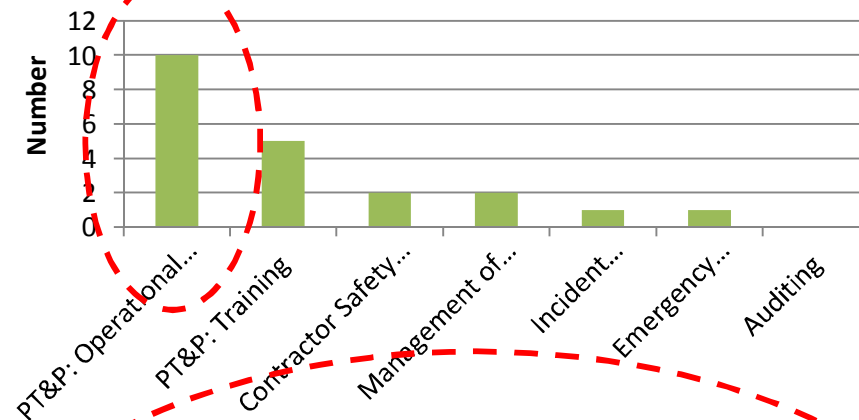
*It was found that many elements related to Operational Discipline were required to improve to prevent reoccurrence of incidents.*

17 incidents (2015-2016)

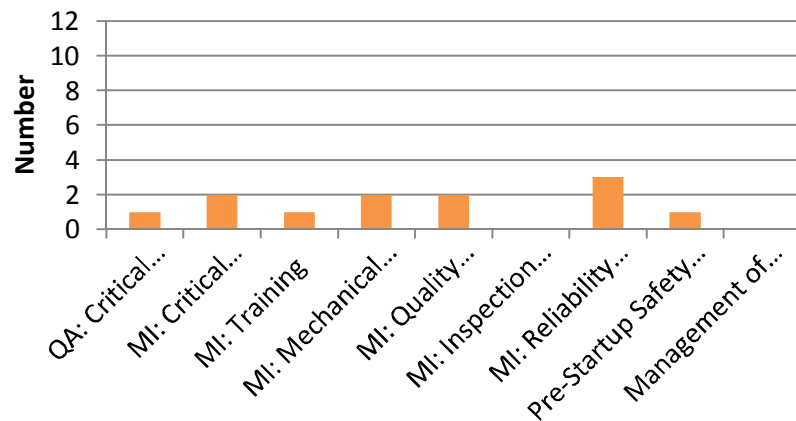
## DuPont PSM: Technology



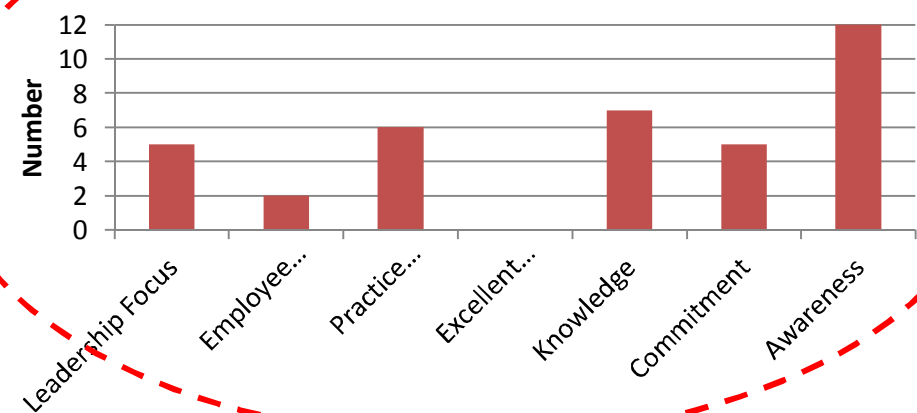
## DuPont PSM: Personnel



## DuPont PSM: Facilities



## Operational Discipline



*Operational Discipline needs to be checked by multiple factors from Organizational View and Individual View.*

## Organizational View

The deeply rooted dedication and commitment by every member of an organization to carry out *each task, the right way, each time.*

+

## Individual View

I am committed to working safely by doing *every task, the right way, every time.*

**OD is NOT...**

**... a method for disciplining people for making mistakes.**

*Operational Discipline is the rim of the DuPont PSM Wheel to achieve Operating Excellence.*

**OD is strongly associated with DuPont PSM...**

## DuPont PSM Implementation Steps

**Step 1 – Establish a safety culture**

**Step 2 – Provide management leadership and commitment**

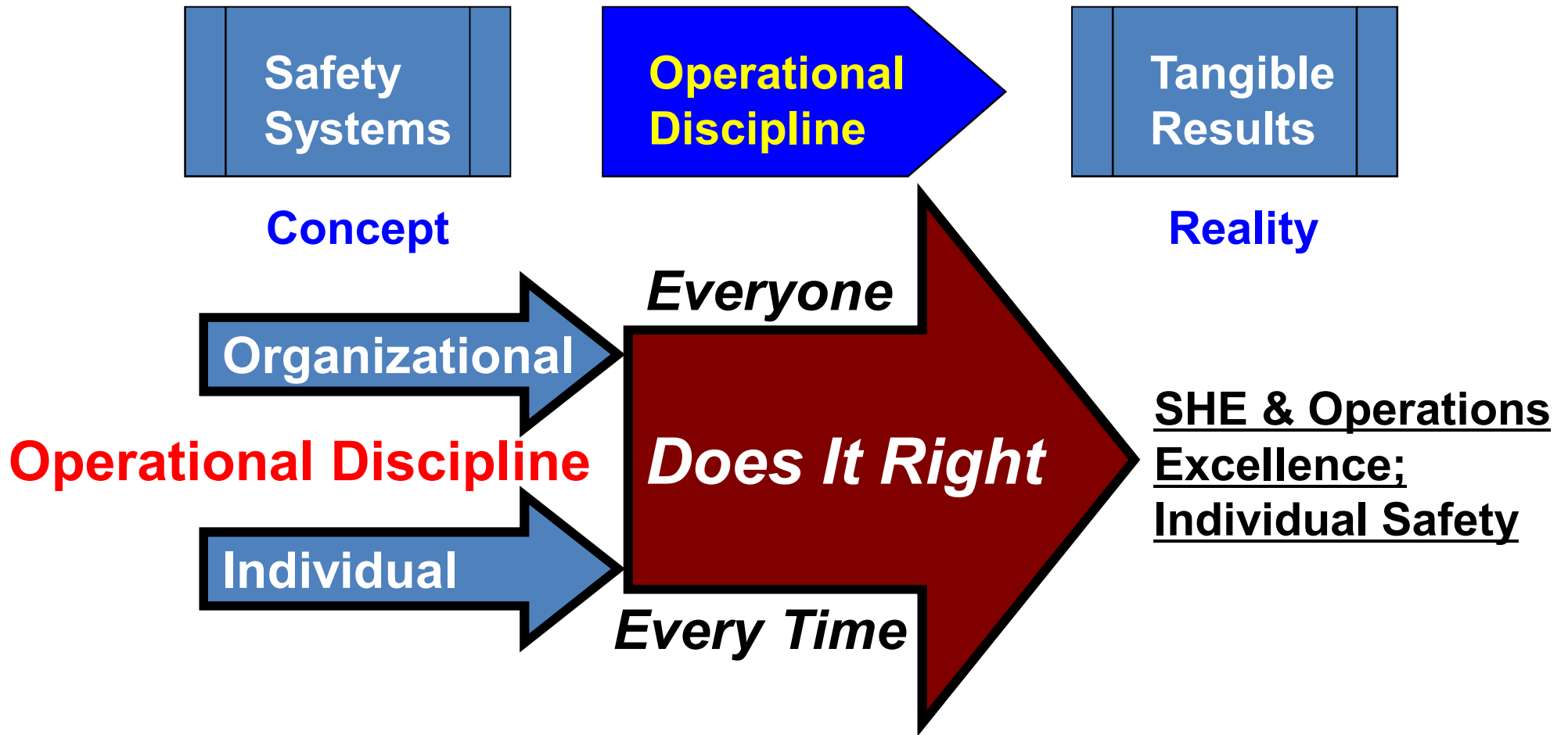
**Step 3 – Implement a comprehensive DuPont PSM program**

**Step 4 – Achieve operating excellence through operational discipline**

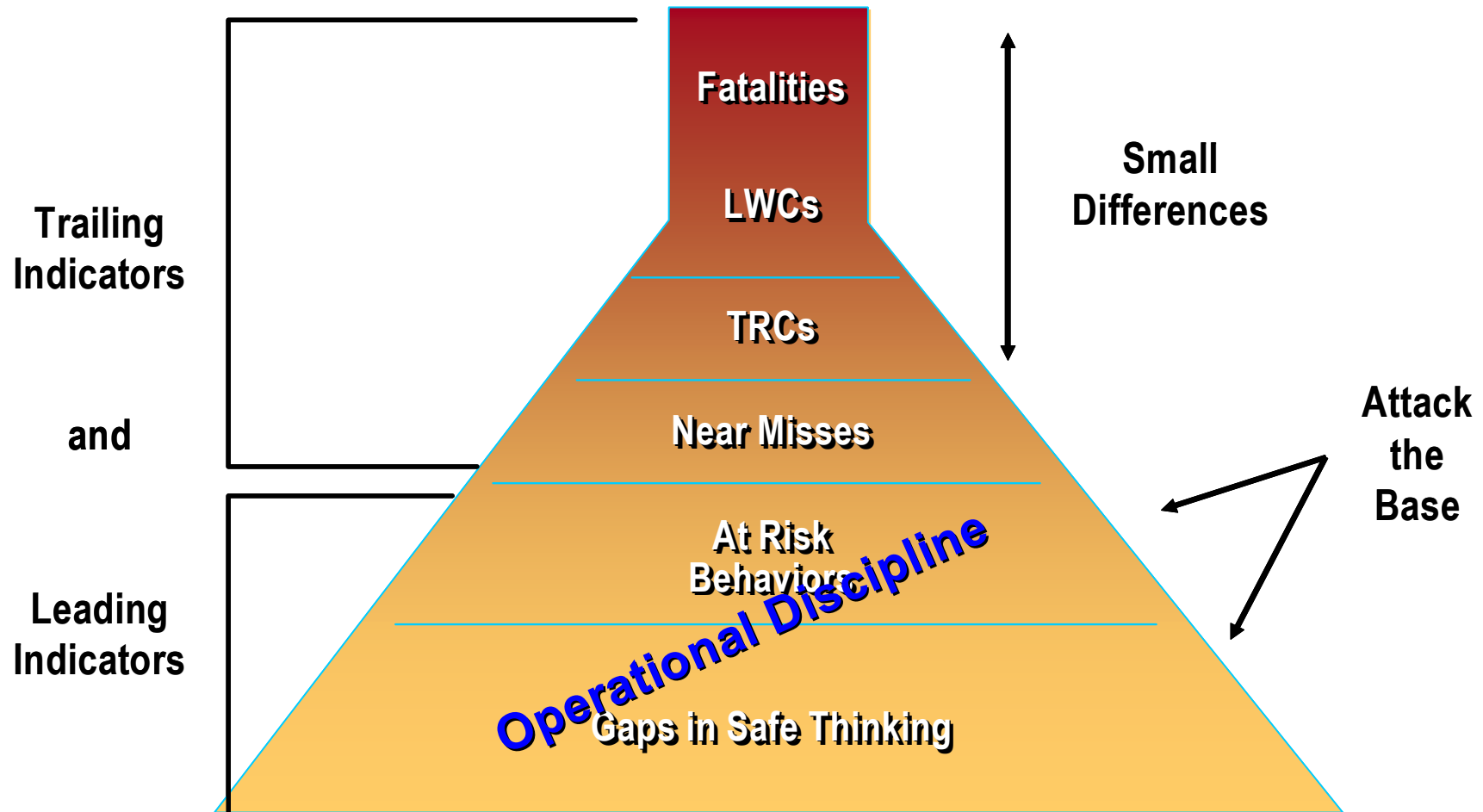
**OD is the rim of the DuPont PSM Wheel**



*Operational Discipline is what translates our safety systems into consistent day-to-day performance, providing excellent SHE and operating results.*



*Improving OD problems at the bottom of the Safety Triangle helps us to avoid injuries at the top of the Triangle.*



*Various approaches for improving OD are being taken at each site.*

- ◆ **OD Workshop** [LSR](#)
- ◆ **OD Self-assessment**
  
- ◆ **Establishment of Life Saving Rules (Corporate)**
- ◆ **Job Cycle Check**
- ◆ **Re-education of Basic Rules**
- ◆ **Review of Site Procedures**
- ◆ **KY Training (Risk Prediction)**
- ◆ **Recognition by Leadership**
- ◆ **5S Patrol (Housekeeping) etc.**



## 【Life Saving Rules】

[LTCT](#)

[Back](#)

**Especially important 11 safety rules which could result in fatality were selected as “Life Saving Rules”.  
Refresher trainings are provided to all the employees and contractors every year.**

### MDP 命を守るルール (Life Saving Rule : LSR)

1. 機器の工事/点検等作業を行う際は、LTCTをしなければならない
  2. 塔槽内等空気の流通の悪い箇所へ立ち入る際は、工場手順に従い、許可を得なければならない
  3. 危険性のある配管又は設備を工事する際は、ライン開放手順に従わなければならない
  4. 回転等動いている機器に触れてはならない
  5. 通電している電気機器・設備の活線、近接作業をしてはならない
  6. インターロックをバイパスしてはならない
  7. 2 m以上の高所作業では、適切な落下防止装置を身につけなければならない
  8. 火気工事を行う際は、工場の手順に従わなければならない
  9. 耐圧及び気密試験を行う際は、工場の手順に従わなければならない
  10. 吊り荷の下に立ち入ってはならない
  11. 車に乗る際は、シートベルトを装着しなければならない
- ※ルールの詳細は工場規則による

1. Follow the site LTCT procedure when working on or inspect any piece of equipment.
2. Obtain a permit per site procedures when performing confined space entry.
3. Follow the site Line Break procedure when working on hazardous pipelines or equipment.
4. No person shall contact any rotating or moving equipment.
5. No person shall work on any energized electrical equipment/facilities.
6. No person shall bypass safety interlocks.
7. Proper fall protection shall be in place when working on height above 2meters.
8. Follow proper site procedures when performing hot works.
9. Follow proper site procedures when performing pressure and leak tests.
10. No person shall stand under a suspended load.
11. Wear the equipped seal belt when driving or riding in a car.

## 【LTCT Procedure】

[Back](#)

Lock the power source, the shut-off valve, etc. to prevent an accident caused by wrong operation during works

Lock

Tag

Clear

Try

Lockout of  
Power Panel



Don't Operate Tags attached by both Production G and Maintenance G



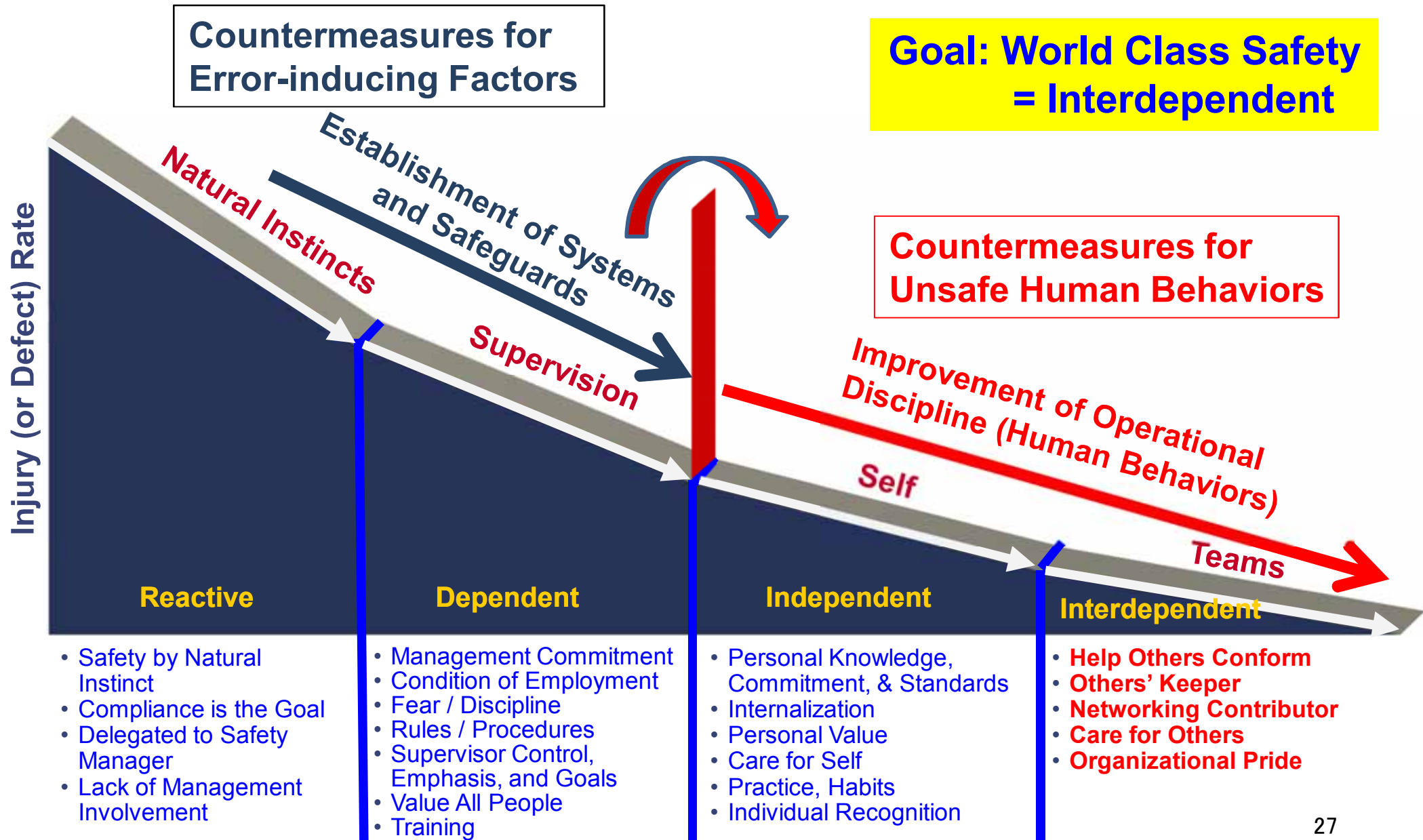
Check the inoperative while pressing the start-up button.



Lockout of Shut-off Valve

Put the key into the key box and lock it by himself.  
(Self-protection)

An invisible wall exists between Dependent and Independent. Need improvement of OD to clear the wall. Our goal is to achieve the Interdependent stage by around 2020.



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*Both plants have been changing steadily through this activity, but we will need to keep making efforts to have the changes ingrained as the real ones.*

#### ◆ **Comments from Outside**

- **A DuPont Leadership**

**”The air in the plant has changed obviously from the past.”**

- **An ISO 9001 3<sup>rd</sup> Party Auditor**

**”I notice apparent changes in this plant from the last year’s audit.”**

#### ◆ **Internal Opinions**

- **A manager transferred in the plant 1.5 years ago**

**”I realize the plant is changing steadily every quarter.”**

- **A Board Director**

**”The current changes are only temporarily. Need five to ten years to ingrain them into the organization. Only the sustained changes are real progress of our safety culture.”**

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- ◆ **Operational Discipline, OD, means “Everyone does it right every time.” and it is strongly associated with DuPont PSM, Process Safety Management, to achieve Operating Excellence.**
- ◆ **OD helps to avoid serious injuries and/or lower risks in process safety.**
- ◆ **By improving OD, DuPont–Mitsui Polychemicals is striving for “World Class Safety”.**

**Thank you very much for your attention!**

**ご清聴ありがとうございました！**