Behavior Based Safety
and
Human Factors Process
at ExxonMobil

Joint EFCOG/DOE

Chemical Management 2003 Workshop

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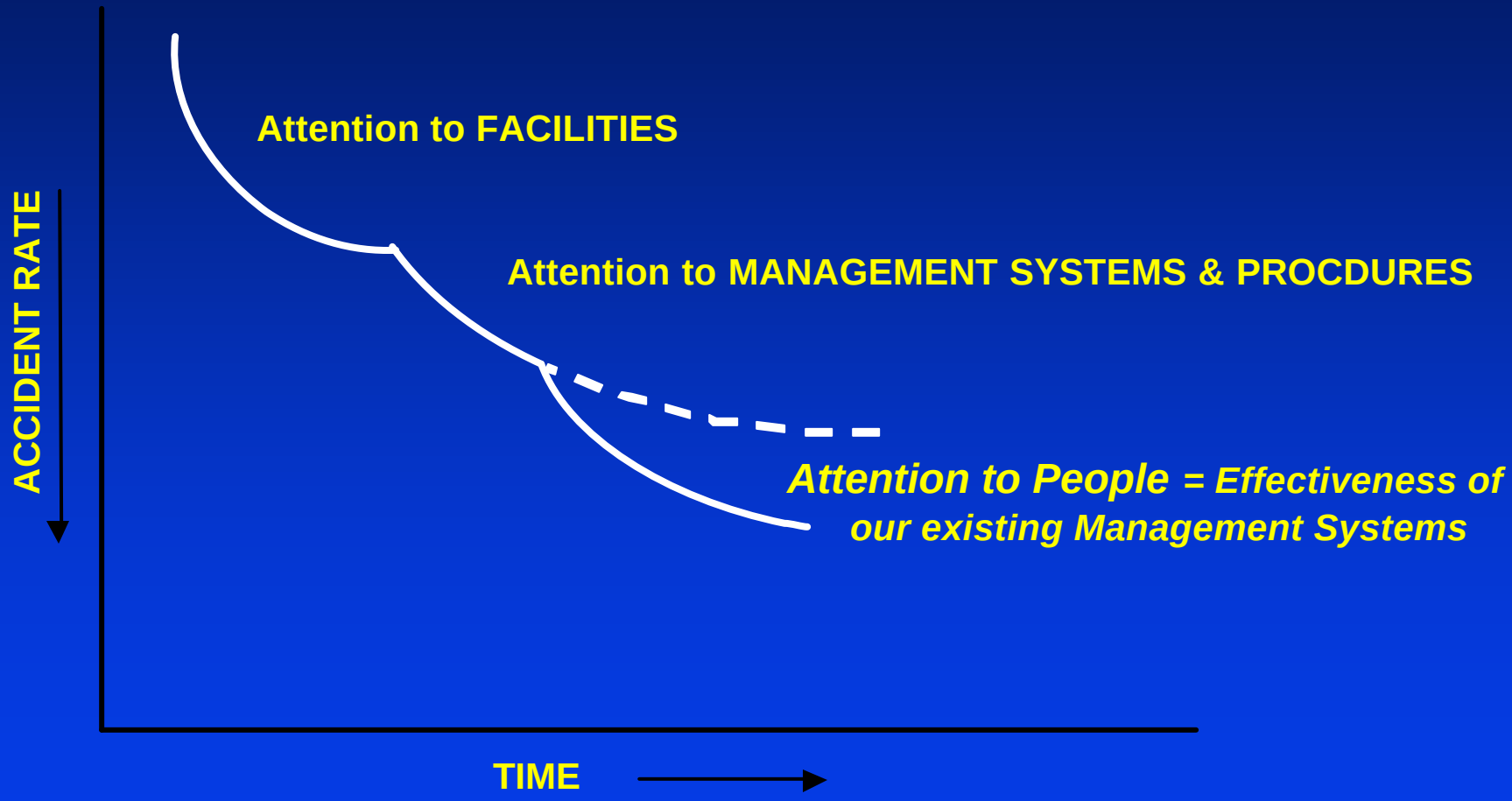
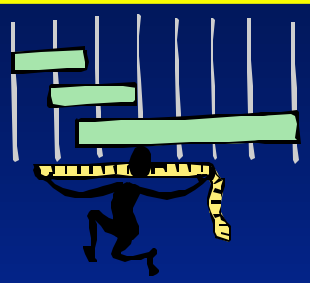
Overview

- Why we are focused on Behavior Based Safety and Human Factors
- What we mean by Human Factors
- What is the Safety Excellence Process
- What type of results have we seen
- Wrap - up

Vision - “Nobody Gets Hurt”



Safety Triangle



Serious Accident — 1

Injury — 3

Damage — 30

Near-misses — 300 - 600

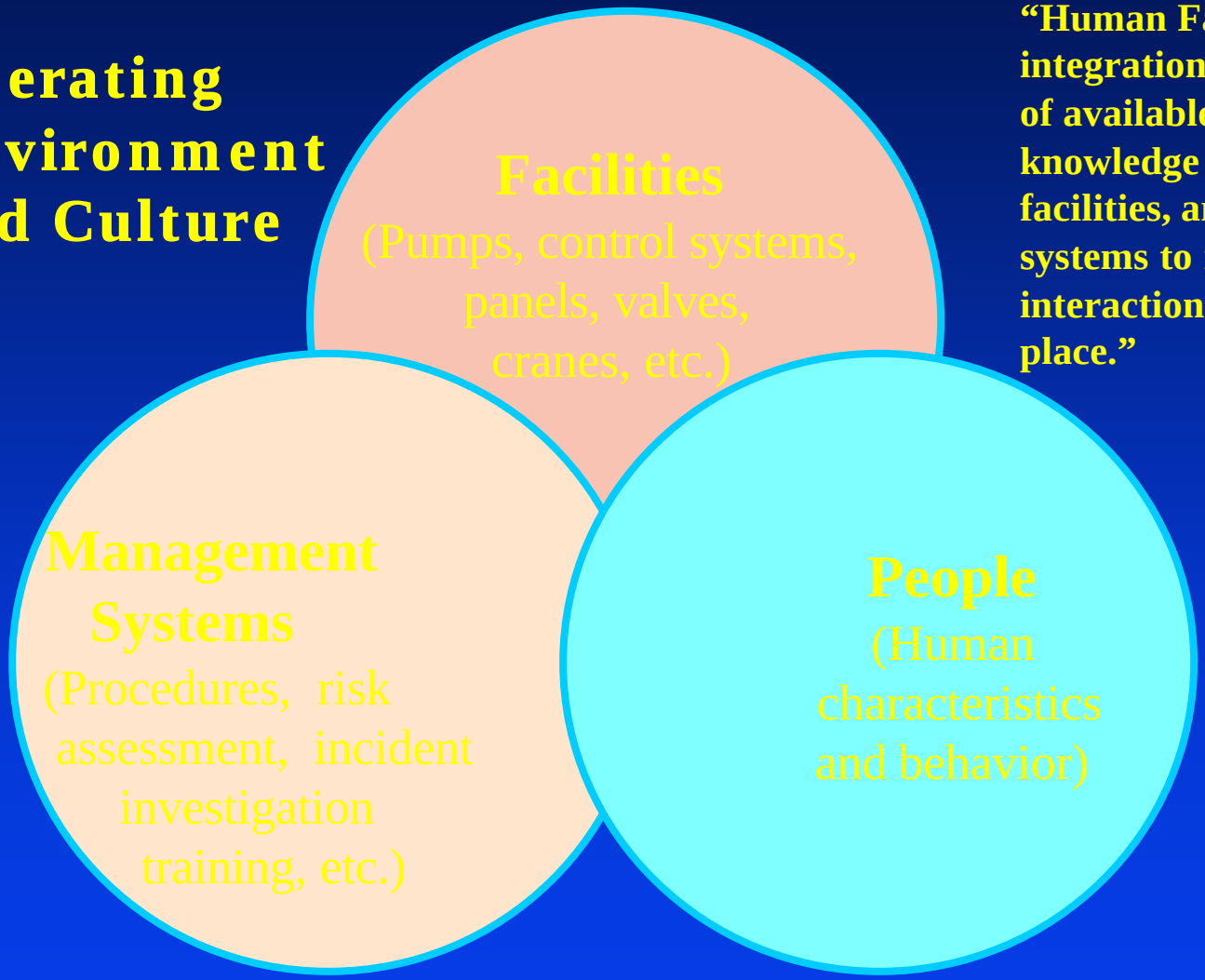
Human Behavior — People

Influences on Behavior — **Technical, Organization, Person :**
Understand Behavior, Management Systems, Ergonomics, Procedures, Organization of Work, Motivation, Skills.

We need to focus here to achieve Nobody Gets Hurt

Human Factors

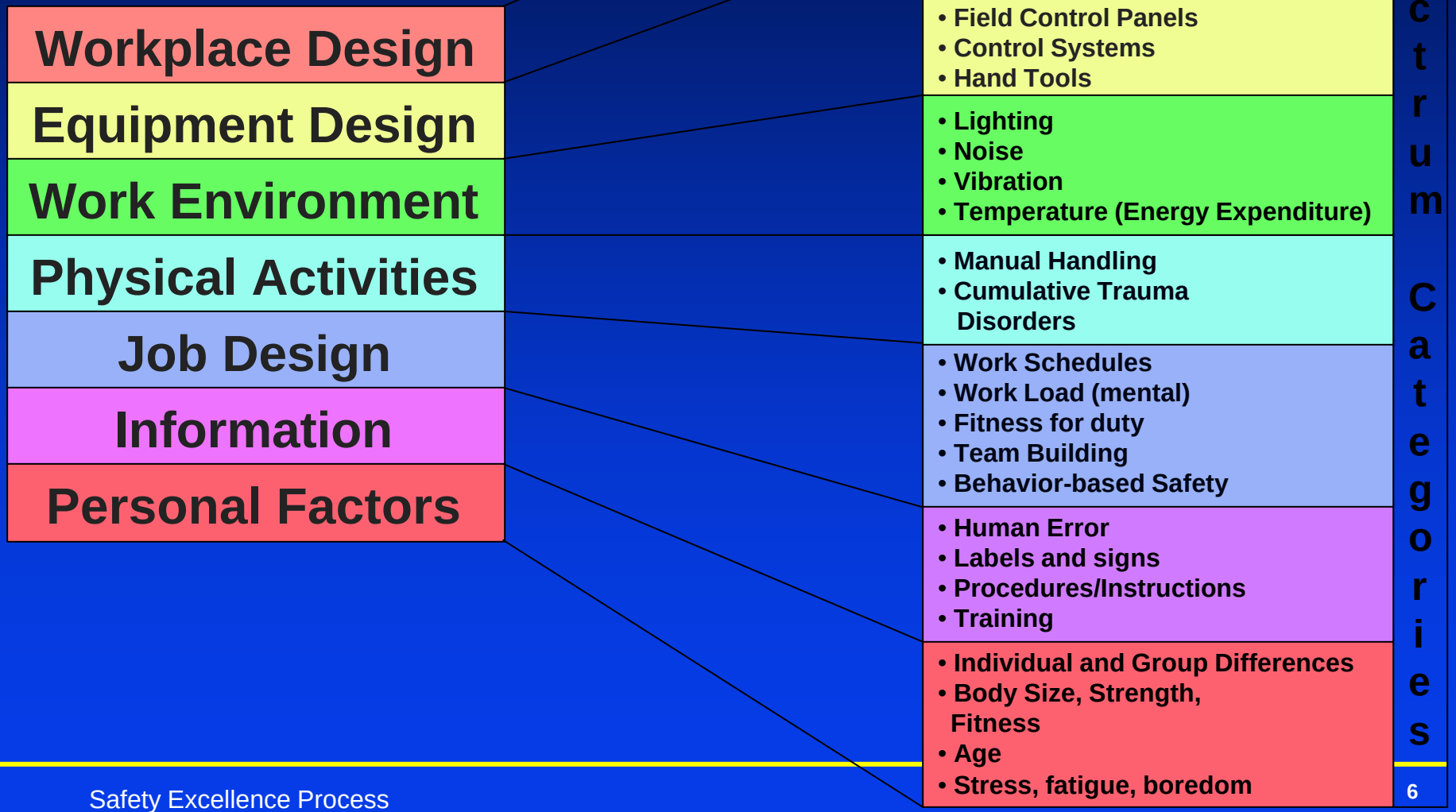
Operating Environment and Culture



"Human Factors is the integration and application of available scientific knowledge about people, facilities, and management systems to improve interactions in the work place."

Human Factors Spectrum

HF Spectrum



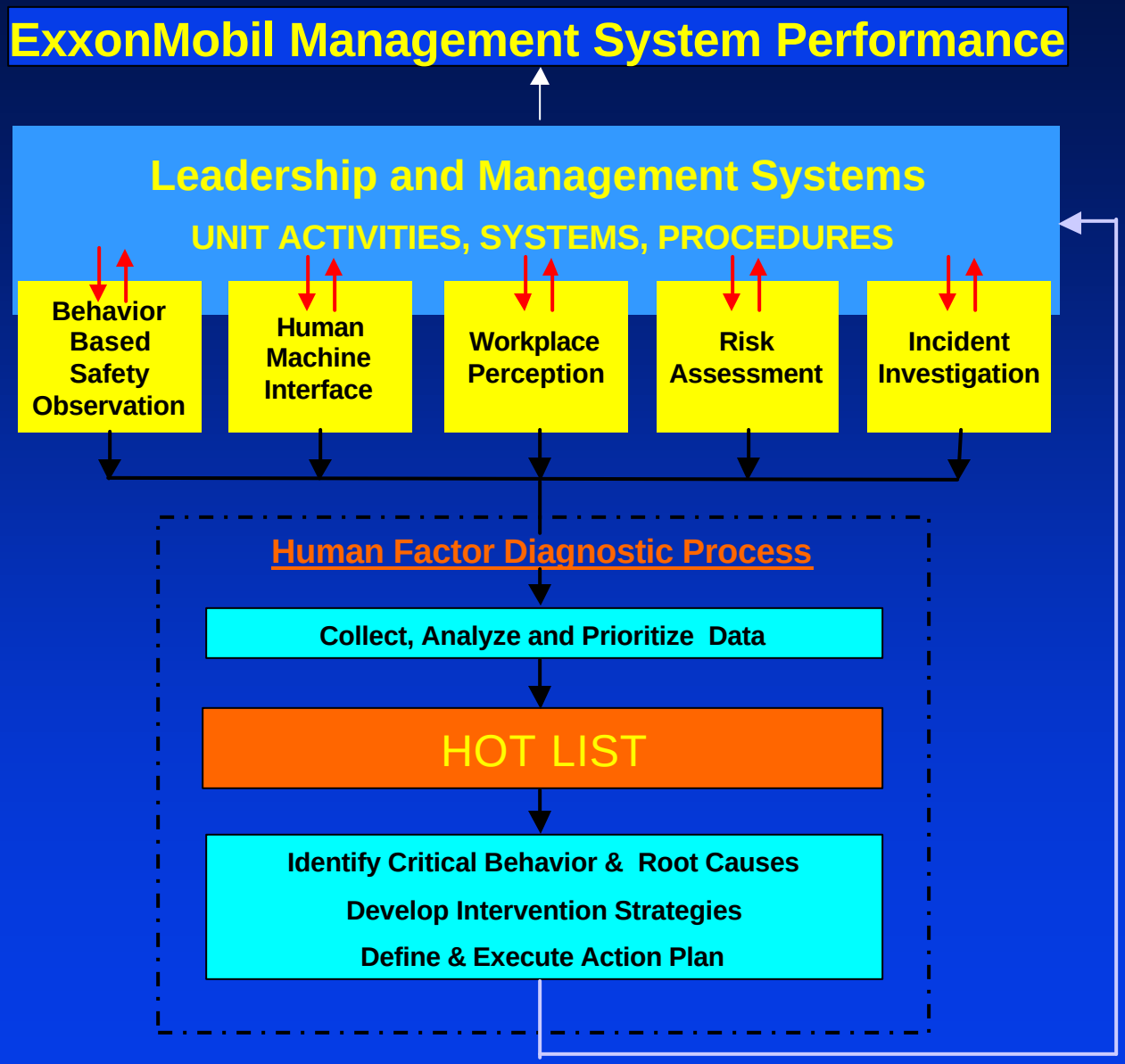
Safety Excellence Process (SEP)

Level I Processes

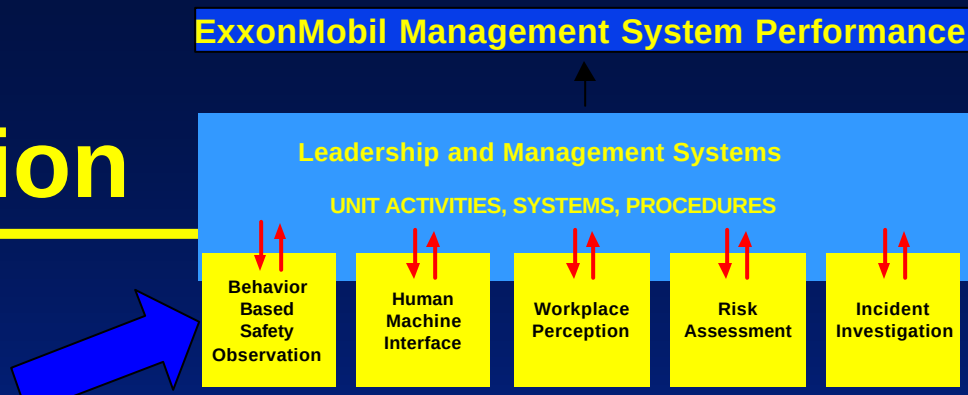
On-going data collection and short term / direct interventions

Level II Process (HFDP)

Periodic analysis and longer term interventions

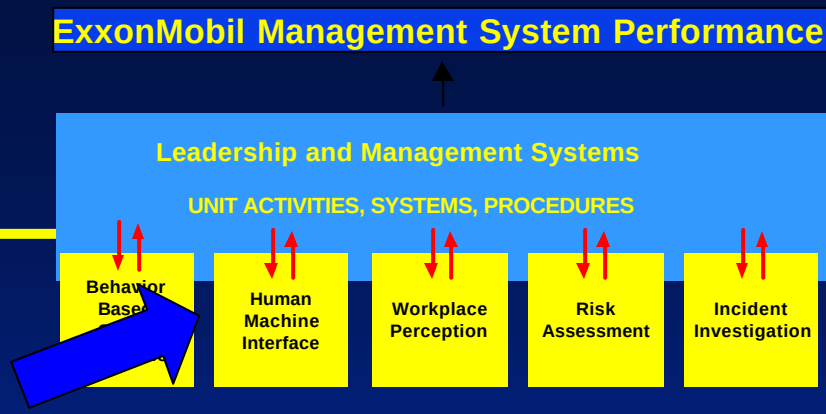


Behavior Based Safety Observation



- **Objective:**
  - All employees and contractors proactively and routinely identify and eliminate unsafe behaviors by themselves and their coworkers.
- **Key Attributes:**
  - All levels of the organization are involved in the observations
  - Mostly peer to peer observations
  - Observations are interactive and used to reinforce safe behaviors and correct unsafe or at risk behaviors.

Human Machine Interface



- **Objectives:**
  - Design and construct facilities for people's use
  - Build it right the first time
- **Systematically apply Human Factors (HF) through out the project life cycle**
  - Incorporate HF into the major project work flow
  - Incorporate HF into the small project work flow (Management of Change process)
  - Identify and improve existing facilities
    - Workforce able to identify and address ergonomic issues

Human Machine Interface
Personal Factors

HF Spectrum

- Workplace Design
- Equipment Design
- Work Environment
- Physical Activities
- Job Design
- Information Transfer
- Personal Factors

Spectrum Category

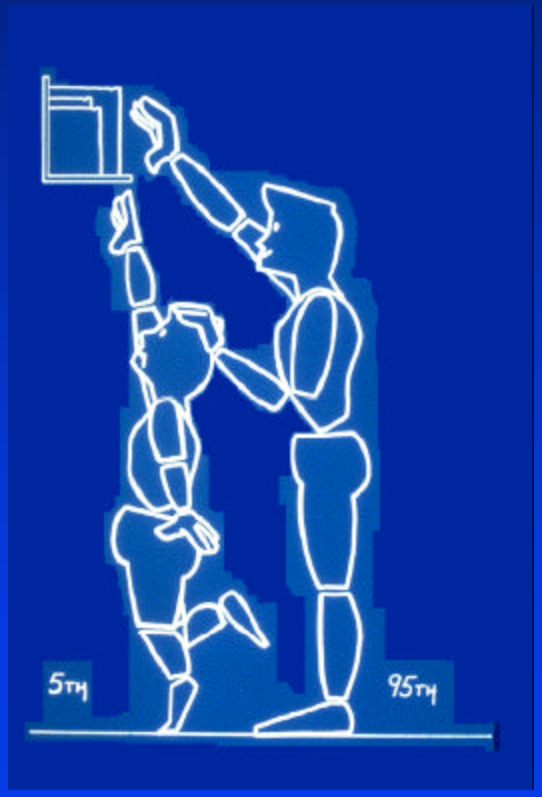
Personal Factors

- Individual and Group Differences
- Body Size, Strength, Fitness
- Age
- Stress, fatigue, boredom

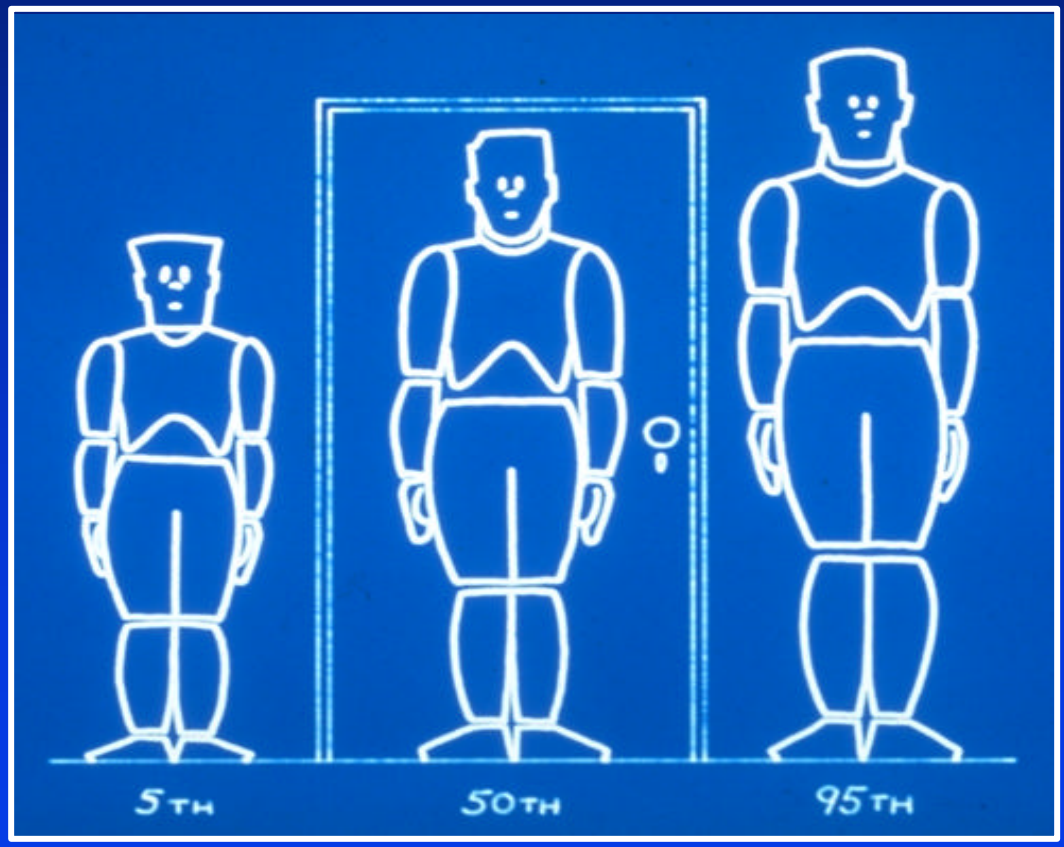
Human Machine Interface
Personal Factors

Designing for the Extreme

Reach



Fit



Human Machine Interface
Personal Factors

Human Machine Interface
Workplace Design

HF Spectrum

- **Workplace Design**
- **Equipment Design**
- **Work Environment**
- **Physical Activities**
- **Job Design**
- **Information Transfer**
- **Personal Factors**

Spectrum Category

Workplace Design

- Facility Layout
- Workstation Configuration
- Accessibility

Access from Stairs and Ladders

Operator must step outside of the safety of the cage to read display

Human Machine Interface Workplace Design

Human Machine Interface
Equipment Design

HF Spectrum

- **Workplace Design**
- **Equipment Design**
- **Work Environment**
- **Physical Activities**
- **Job Design**
- **Information Transfer**
- **Personal Factors**

Spectrum Category

Equipment Design

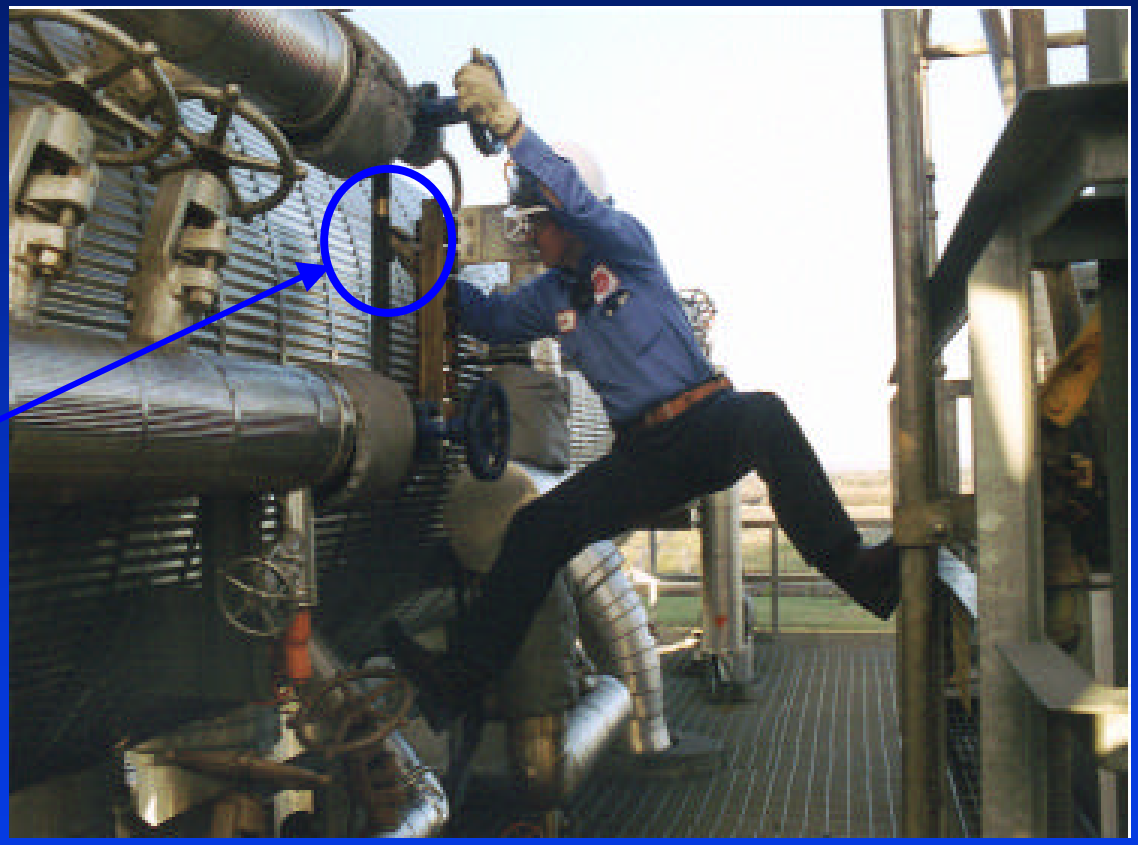
- Controls
- Displays
- Field Control Panels
- Control Systems
- Hand Tools

Human Machine Interface Equipment Design

Display layout should be compatible with the equipment that is being controlled

Human Machine Interface Equipment Design

Field displays should be located to ensure that they can be easily read

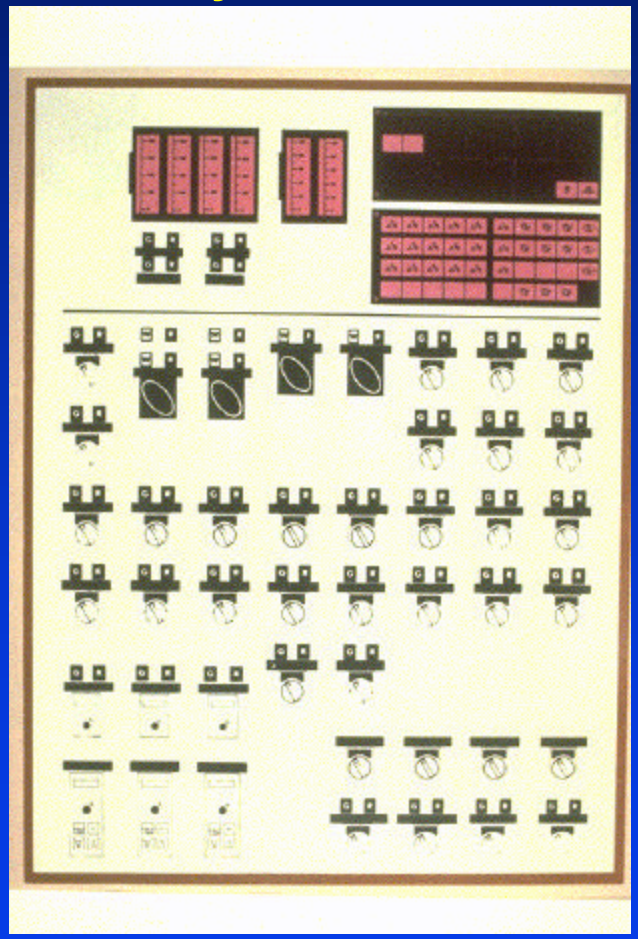


Note flashlight in his right hand. The light is used to more easily see the liquid level

Human Machine Interface Equipment Design

Functional Grouping: *Related functions are located together in an easily identifiable fashion*

Not this



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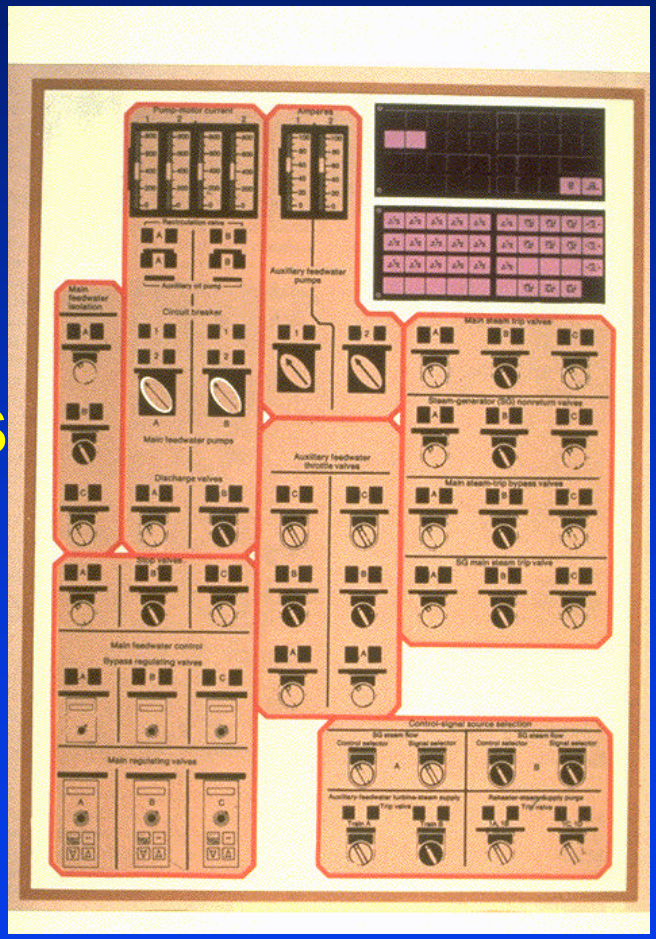
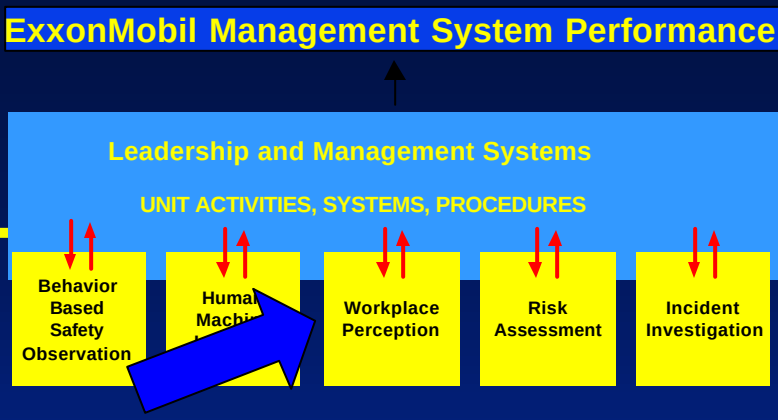
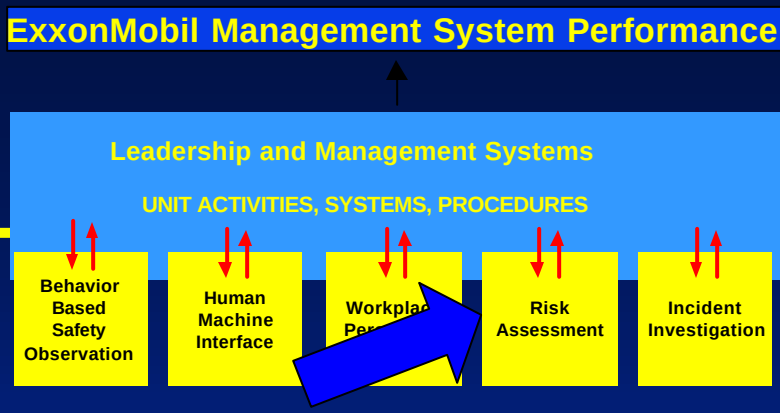


Workplace Perception



- **A systematic process for collecting worker input regarding the strengths and areas for improvement.**

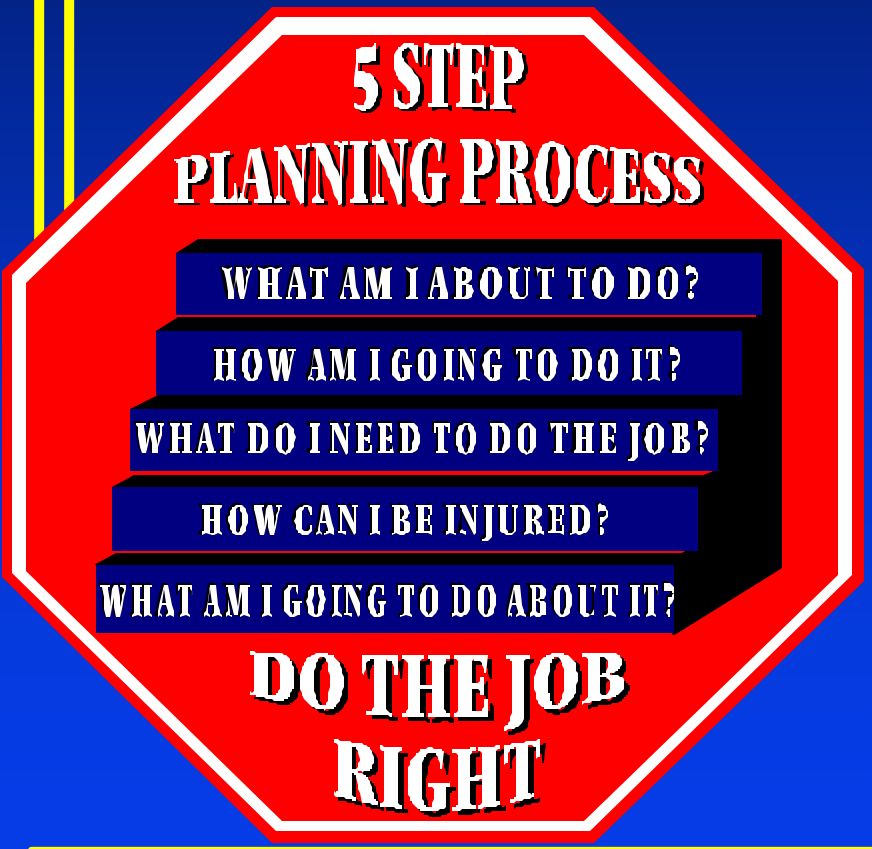
Risk Assessment

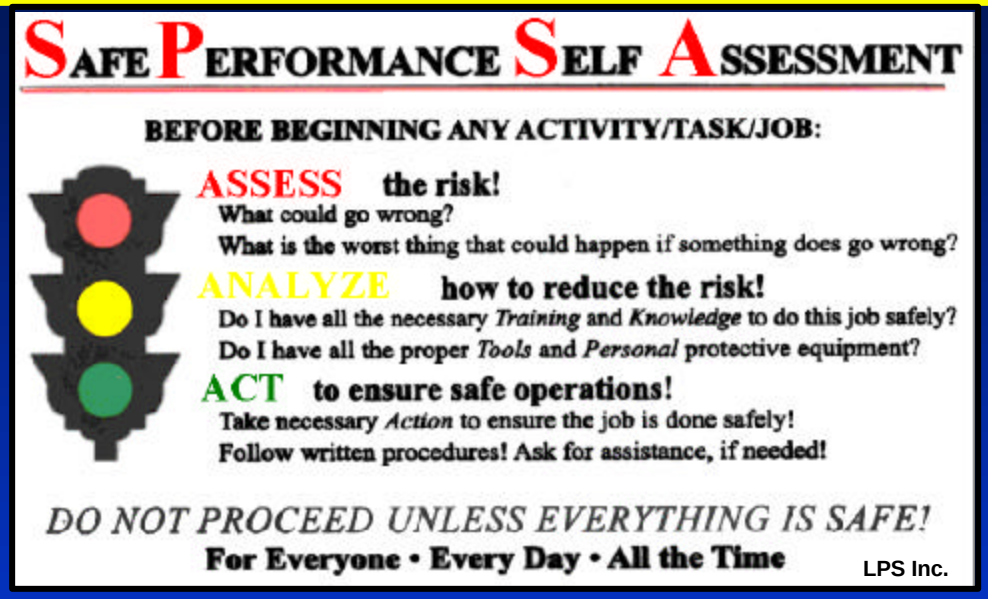


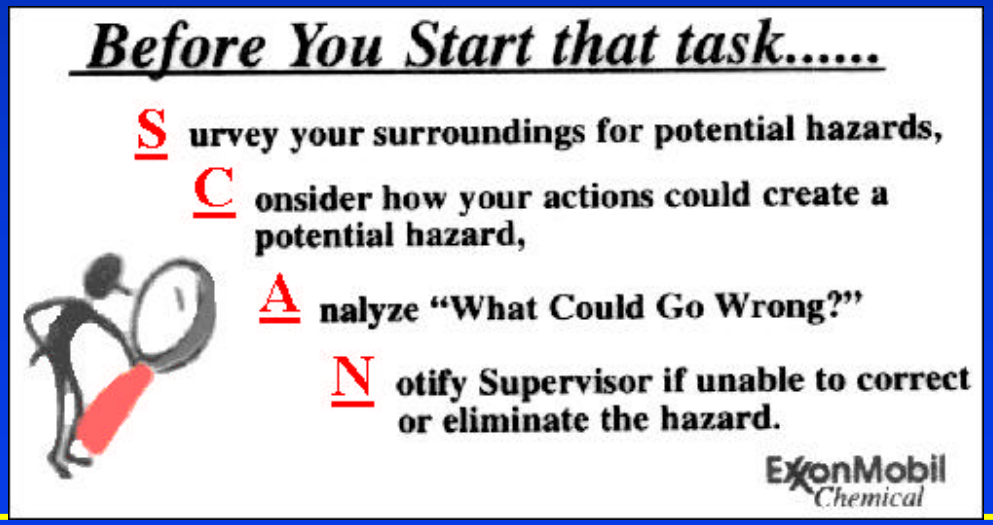
- **Risk analysis tools are used to identify and address HF issues associated with**
  - Facilities
    - Critical Task Analysis (CTA)
    - Process Hazard Analysis (PHAs)
  - Planned tasks and procedures
    - Job Safety Analysis (JSA) or Task Risk Analysis (TRA)
  - Real-time actions
    - Last Minute Risk Assessment - a simple memory based process that is used by the workers prior to starting an activity

Last Minute Risk Assessment (LMRA)

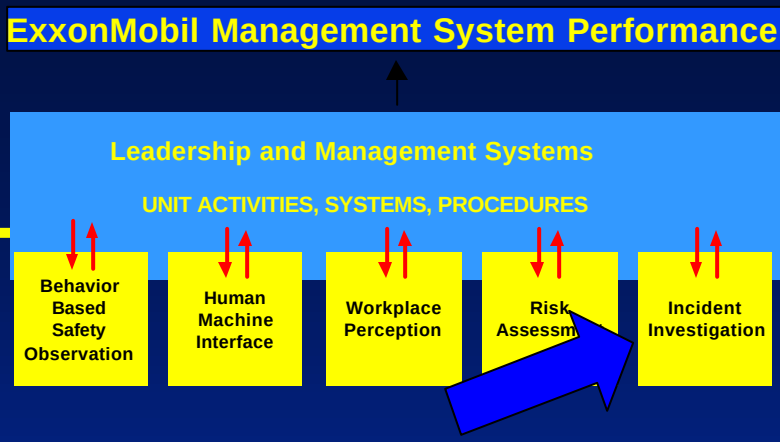
Examples







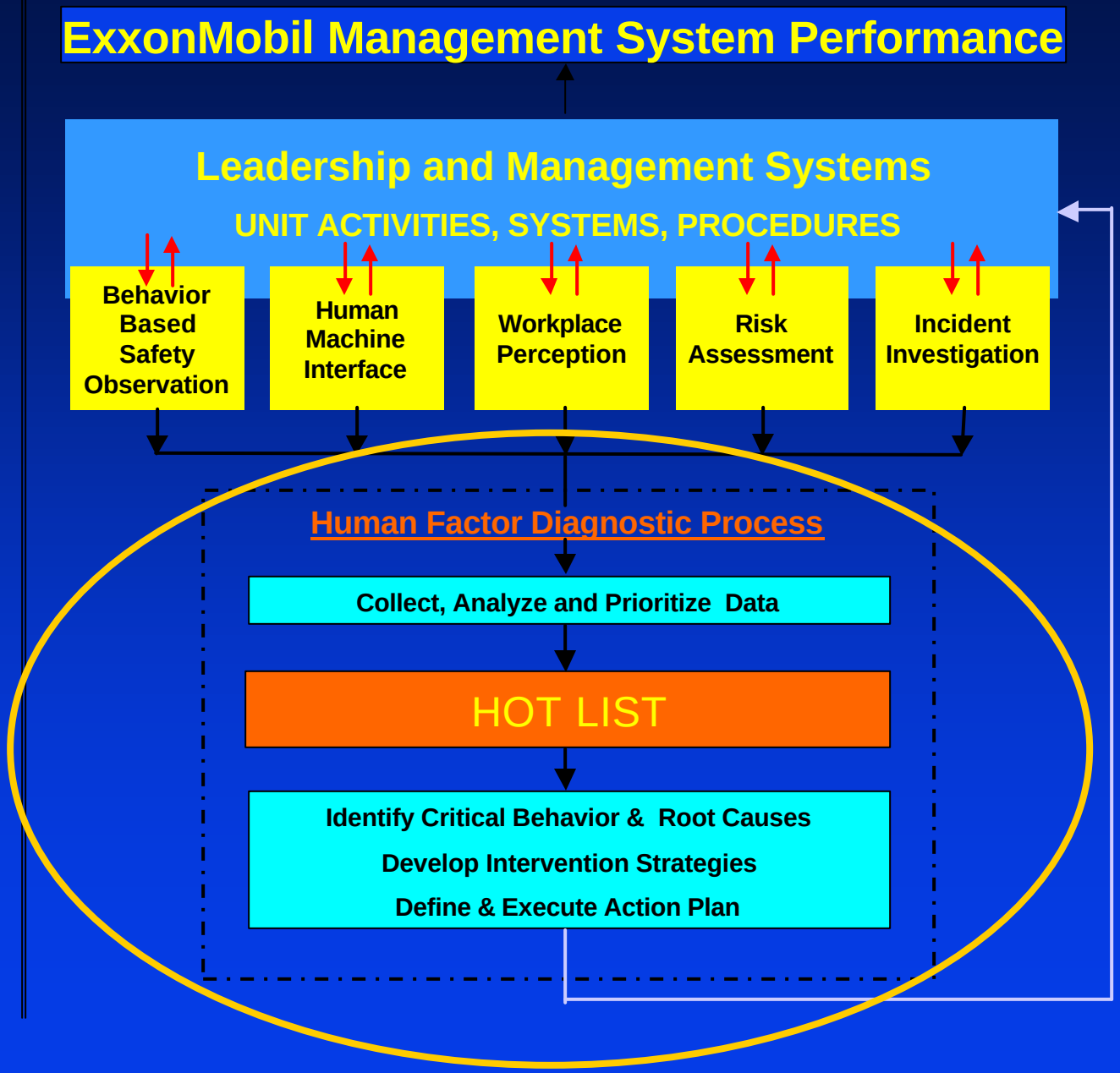
Incident Investigation



- Incidents and near-misses are investigated using Root Cause Analysis Tools
- Individual incident and common cause analyses include identifying Human Factors issues
- Belief that

"Human error is a result, not the cause"

Safety Excellence Process (SEP)



Level I Processes

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Level II Process (HFDP)

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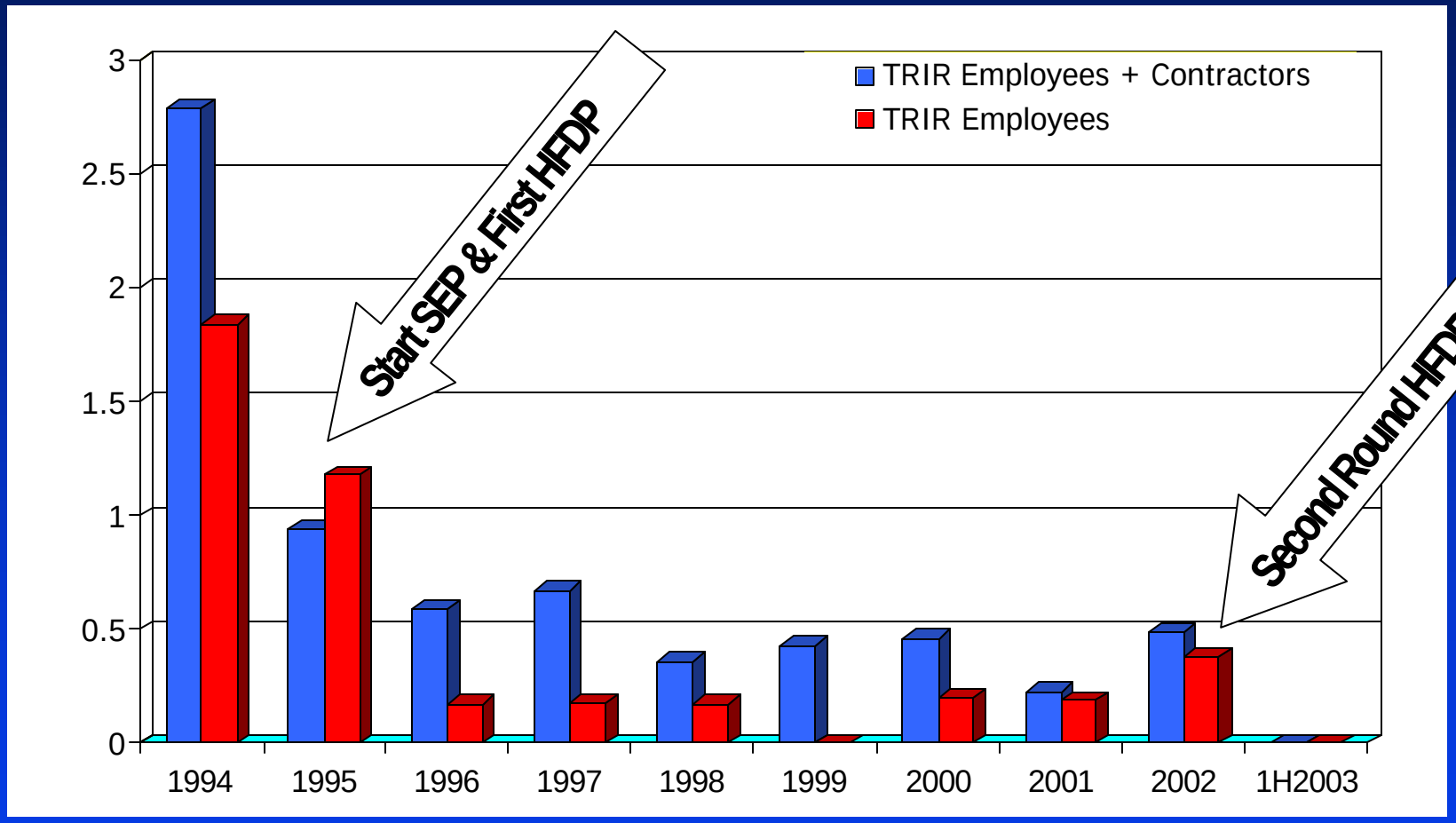
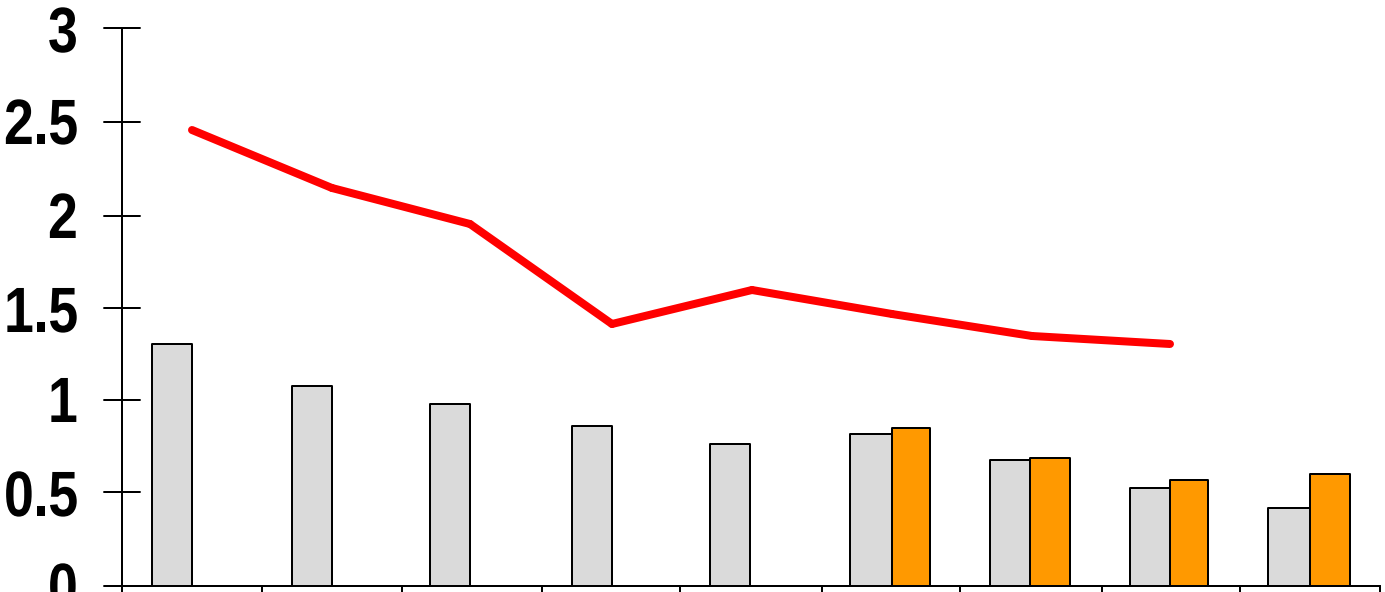
Safety Excellence Result



Exxon Mobil Corporate

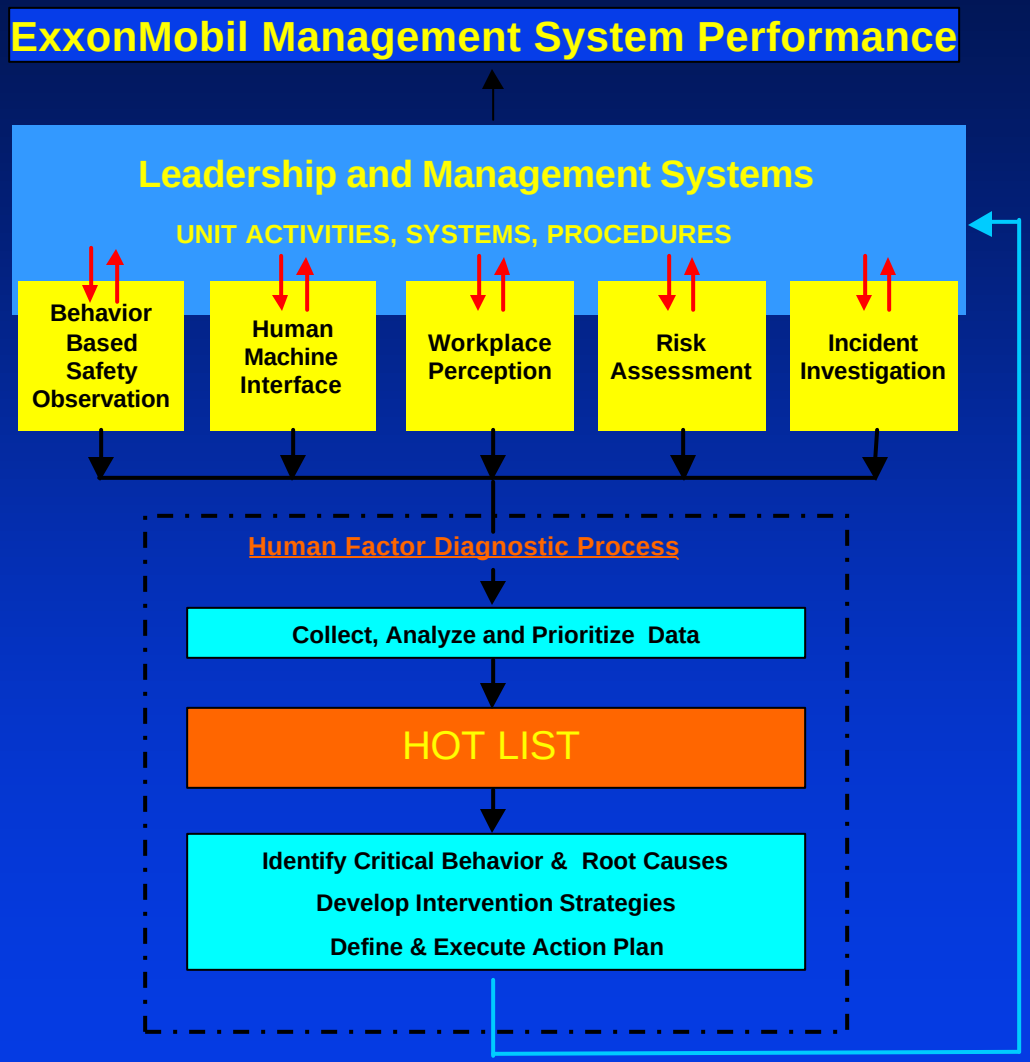
Total Recordable Injuries and Illnesses

incidents per 200,000 work hours



	95	96	97	98	99	00	01	02	1Q03
Employees	1.31	1.07	0.97	0.86	0.76	0.825	0.674	0.53	0.412
Contractors						0.84	0.693	0.575	0.61
US Petroleum Industry Benchmark	2.45	2.14	1.95	1.4	1.6	1.46	1.35	1.3	

Safety Excellence Process



Strengths

1. Breadth of Human Factors - All 5 level 1 processes

2. Raising the Human Factors Bar within each Level I area

3. Conducting the Human Factors Diagnostic Process to identify and work the site's most important issues.