



Setting the Standard for Automation™

High Performance Operators

A Chemical and Petroleum Industries
Division (CHEMPID) Webinar
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Seminar Logistics

- **Seminar format**
 - 90-minute total presentation
 - Question and Answer Session (chat and audio)
 - 1.5 Professional Development Hours (PDH)
 - Survey
- **Seminar length**
 - Three 20-minute presentation sessions
 - Three 10-minute question and answer sessions

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Audio Instructions

- Please note the following during the seminar:
- As a participant, you are in a “listen-only” mode.
- You may ask questions via the chatbox, using your keyboard, at any time during the presentation.
- However, the presenter may wait to answer your question until the next Q&A Session.

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Question and Answer Sessions

- During the presentation, questions may be asked via the meeting chat function.
- Your question will be placed into a queue and answered at the subsequent Q&A session.
- While in the queue, you will be in a listen-only mode.
- If there is time remaining at the end of the presentation, it will be opened up for live questions to the presenter.

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Today's Presenter



Meet the Presenter

Ian Nimmo is an Electrical Engineer by training and education and was involved in the early days of automation. Previously holding a position at Imperial Chemical Industries in the UK, he oversaw all process control systems within Teesside Operations.

He developed techniques, such as the Control Hazard and Operability Study (CHazOp) procedures, for evaluating control systems operability and automation safety. Today, he is President and CEO of User Centered Design Services—a service organization providing ASM solutions and Human Factor and Ergonomic solutions.

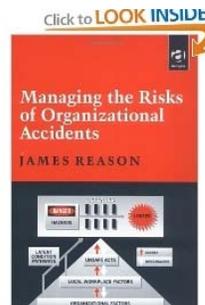
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Key Benefits of Seminar

How to Reduce Risk of Operator Error through an extensive program of Human Performance Improvement and avoidance of Organizational Accidents like BP Texas City.

Center for Human Factors & Ergonomics CHFE



Section 1: Human Performance Improvement



- Human performance improvement (HPI) as addressed in this presentation is not a program per se, such as Six Sigma, Total Quality Management, and the like.
- Rather, it is a set of concepts and principles associated with a performance model that illustrates the organizational context of human performance.
- The model contends that human performance is a system that comprises a network of elements that work together to produce repeatable outcomes.
- The system encompasses organizational factors, job-site conditions, individual behavior, and results.

Extracts from DOI HPI Handbook V I&II

Human Performance Improvement



- The system approach puts new perspective on human error: it is not a cause of failure alone, but rather the effect or symptom of deeper trouble in the system.
- Human error is not random; it is systematically connected to features of people's knowledge, tools, the tasks they perform, and the operating environment in which they work.





Human Performance Improvement

- In its simplest form, human performance is a series of behaviors carried out to accomplish specific task objectives (results).
- Behavior is what people do and say—it is a means to an end.
- Behaviors are observable acts that can be seen and heard.
- Behavior based safety is one of the three pillars of an Integrated Safety Management System.
- The behaviors of operators, technicians, maintenance crafts, scientists and engineers, waste handlers, and a myriad of other professionals are aggregated into cumulative acts designed to achieve mission objectives.



Human Performance Improvement

- The primary objective of the operating facilities is the continuous safe, reliable, and efficient production of mission-specific products.
- Improving human performance is a key in improving the performance of production facilities.
- It is not easy to anticipate exactly how trivial conditions can influence individual performance.
- Error-provoking aspects of facility design, procedures, processes, and human nature exist everywhere. No matter how efficiently equipment functions; how good the training, supervision, and procedures; and how well the best worker, engineer, or manager performs his or her duties, **people cannot perform better than the organization and management systems supporting them.**



Human Performance Improvement

- Human error is caused not only by normal human fallibility, but also by incompatible management and leadership practices and organizational weaknesses in work processes and values.
- Therefore, defense-in-depth with respect to the human element is needed to improve the resilience of programmatic systems and to drive down human error and events.



Human Performance Improvement

- We examine the individual and leader behaviors needed to reduce error, as well as improvements needed in organizational processes and values and job-site conditions to better support worker performance. Fundamental knowledge of human and organizational behavior is emphasized so that managers, supervisors, and workers alike can better identify and eliminate error-provoking conditions that can trigger human errors leading to events in processing facilities.

Ultimately, the attitudes and practices needed to control these situations include:



- the will to communicate problems and opportunities to improve;
- an uneasiness toward the ability to err;
- an intolerance for error traps that place people and the facility at risk;
- vigilant situational awareness;
- rigorous use of error-prevention techniques; and
- understanding the value of relationships.

Roles & Responsibilities



- **Line Management Responsibility for Safety.** Line management is directly responsible for the protection of the public, the workers, and the environment.
- **Clear Roles and Responsibilities.** Clear and unambiguous lines of authority and responsibility for ensuring safety shall be established and maintained at all organizational levels within the Department and its contractors.
- **Competence Commensurate with Responsibilities.** Personnel shall possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities



First Steps

- **Balanced Priorities.** Resources shall be effectively allocated to address safety, programmatic, and operational considerations. Protecting the public, the workers, and the environment shall be a priority whenever activities are planned and performed.
- **Identification of Safety Standards and Requirements.** Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards and requirements shall be established which, if properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences.



First Steps

- **Hazard Controls Tailored to Work Being Performed.** Administrative and engineering controls to prevent and mitigate hazards shall be tailored to the work being performed and associated hazards.
- **Operations Authorization.** The conditions and requirements to be satisfied for operations to be initiated and conducted shall be clearly established and agreed upon.



Review of Key Points

- Human Performance Improvement is not a program.
- It addresses organizational context of human performance.
- The system encompasses organizational factors, job-site conditions, individual behavior, and results.
- The system encompasses organizational factors, job-site conditions, individual behavior, and results.
- Understanding the roles of individuals, supervisors, managers and the management systems that support the tasks we do.
- The impact of the environment on human performance.



Live Question and Answer Session #1

- During Q and A, questions may be asked via chat or your telephone line.
- During Q&A session, the instructor will read questions and address in the time allotted.
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Section 2: Roles & Responsibilities

Roles & Responsibilities Need to be Defined:

Job Performance Profile

A competency model is developed by gathering data from people who are in, or have a good understanding of, the position for which the competency model is being made. These people answer questions regarding the tasks involved in performing the job, future changes expected in the job, and the qualities a person must have to perform the job well. The data is then compiled and sorted into groups of similar knowledge, skills, and attributes.



Control Room Operators

- Own and operate the Process Controls under a multiplicity of process control strategies and conditions to achieve the production plan.
- A CRO's authority and responsibility to make decisions and take actions during normal operations;
- Optimizing process cost and performance
- Trending data to predict and prevent failures



Control Room Operators

- Responding to process deviations
- Managing Abnormal Situations
- Starting up and Shutting down the process
- Stabilizing the process
- Optimizing the process and maintaining quality targets



Control Room Operators

- Maintaining process safety
- Meeting product specifications
- Transfer of custody of the process control system to an oncoming shift using prescribed information and procedures
- Following Conduct of Operations and Operating Discipline.

Control Room Operators



- Managing the process workload as anticipated Staffing Studies? A requirement by PHMSA CRM no where else!
- Training of Apprentices in this area is a Best Practice.
- Shift Handover still needs further improvements.
- Communications and Collaboration with the Field Operators needs improvement.
- Verification and Supplemental/Refresher training are required
- (Trust but Verify)

Field Operators



A Field Operator to own operate and care for process equipment in the field to ensure its operating integrity.

The Field Operator is responsible for:

- Safety & Environmental Steward
- Reports unsafe conditions & environmental concerns
- Operating to standards,
- Preventing equipment detrition,
- Caring for equipment,
- Coordinating predictive and preventative maintenance activities,
- Monitors maintenance safety and permit compliance
- Conducts scheduled safety and environmental surveys



Field Operator

- Ensures good housekeeping
- Maintaining process safety and mechanical integrity, preparing equipment for maintenance and replacement, isolating sources of energy,
- Transferring responsibility of equipment to maintenance through Work Permit Systems and inspecting and transferring equipment from maintenance into service.
- Transfer of custody of the equipment to an oncoming shift using prescribed information and procedures.
- Having good Situation Awareness, being committed safe operations
- Following the Conduct of Operations and Operating Discipline requirements.



Field Operator

- We believe clearer Roles & Responsibilities will clarify and focus attention where it is needed.
- We see the major difficulty of ownership like the person who rents a car, they just drive it and show it no love, if we see ownership of the car, we pay attention to the health and wellbeing of the car.
- To get more ownership we feel the operator needs more authority and buy in to the process, they should run morning meetings, conduct equipment care, and condition monitoring and they should get feedback on all Observations and Notifications they generate. No one should should bypass or do the field operator duties other than a field operator.



Review of Key Points

- Roles & Responsibilities need to be clarified.
- Training and Education should be based on competencies identified in the Roles & Responsibilities.
- Jobs should be defined in a Job Performance Profile identifying competencies in Personal, Interpersonal, Functional, Technical Categories with Behavioral Indications to support them.
- Job knowledge is often short circuited by progression skipping, the need to fill an empty post with the next best alternative to a fully competent and trained individual.
- Complacency and boredom is the opposite of commitment, cutting corners, and compromising safety.



Live Question and Answer Session #2

- During Q and A, questions may be asked via chat or your telephone line.
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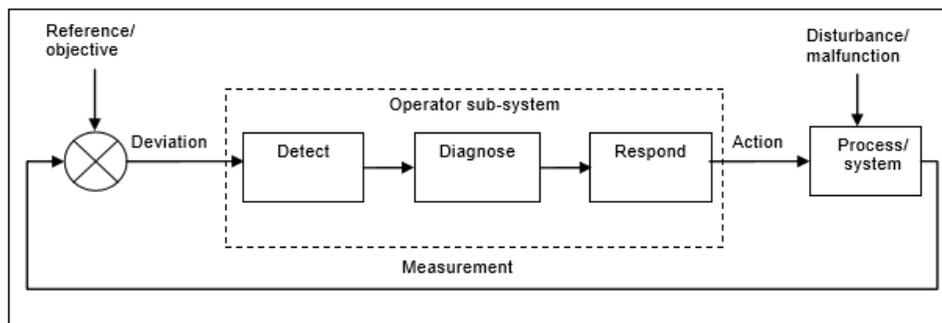
Section 3: Human Factors to Improve Operator Performance



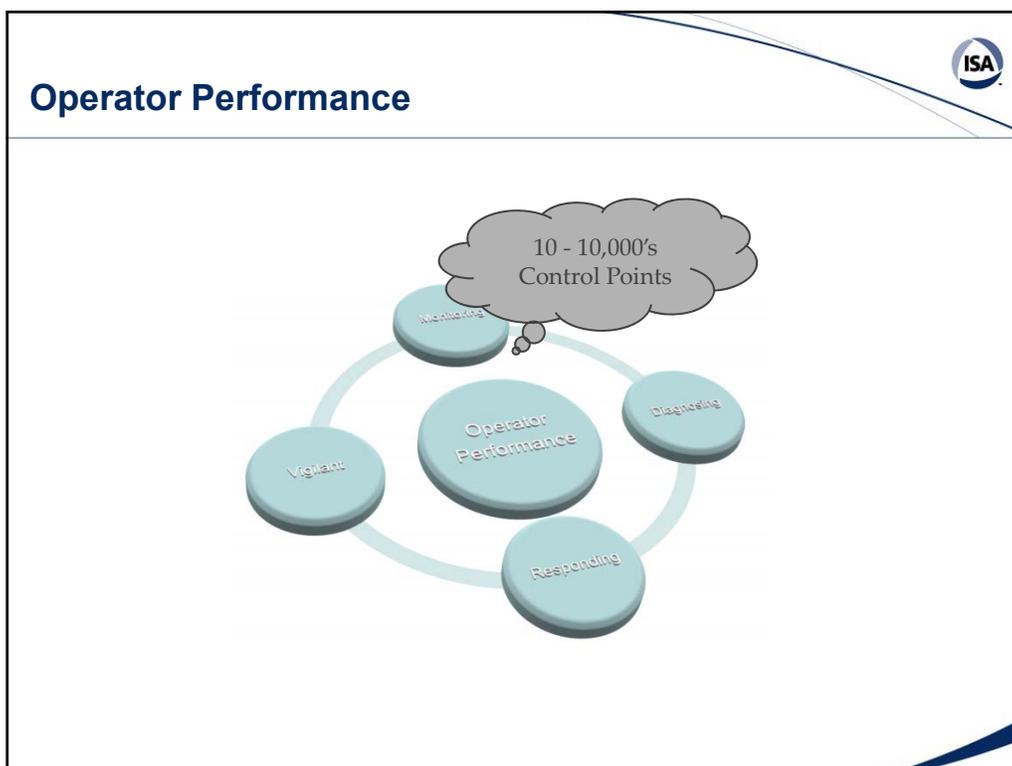
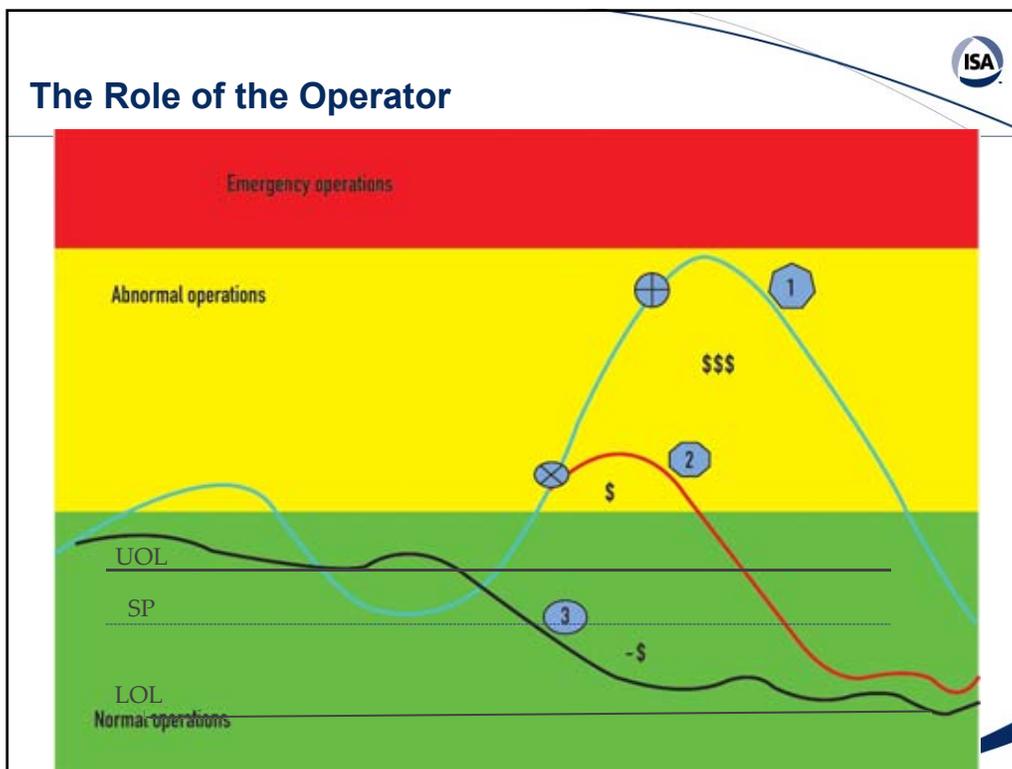
We rely on console (Process Control) Operators to be vigilant during long shifts and expect them to intervene during abnormal situations.

- † How quickly and accurately they define a problem can make a major effect on uptime and safety.
- † Operator performance is affected by the environment, workload, work team design, HMI, Alarm, communications, fatigue, procedures, training, and culture.

Feedback Model of Operator-Process Interaction



IEC FDIS 62682 © IEC 2014/ISA SP18





Monitoring - Good Situation Awareness

- Using multiple screens on a Console
- Using Alarm Management tools
- Observations & Communications from Outside (Field) Operators or Maintenance People



Maintain Your Situation Awareness

- Know the Game Plan
- Anticipate Possible Events
- Follow Known Procedures
- Cross Check and Verify
- Verbalize “Red Flags”
- Provide on-going Updates





Maintain Your Situation Awareness

- The Loss of Situation Awareness usually occurs over a period and will leave a trail of clues or red flags that warn of lost or diminished Situation Awareness.
- Always Remain Alert
- Situation awareness is the ability to identify, process, and comprehend the critical elements of information about what is happening to the team regarding to the mission.
- More simply stated, situation awareness is always knowing what is going on around you.




Responding Correctly

- Competence
- Possessing skills,
- Knowledge,
- Qualifications, and capacities to do job
- properly and safely
- Comes with training, education, and experience
- Not job (progression) skipping






Monitoring & Responding

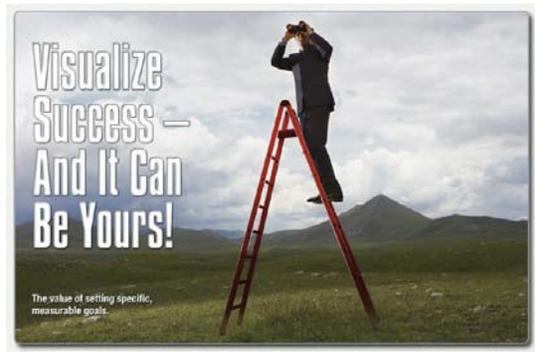
Practice **situational awareness**

- Scan your environment for hazards
- Consider how equipment, facilities, people, conditions may change
- Understand potential hazards
- Formulate mental plan for how to handle / avoid hazards



How to Develop Competence

- Focus on task at hand
- Visualize completing task accurately and safely
- Mentally review safe work practices to follow



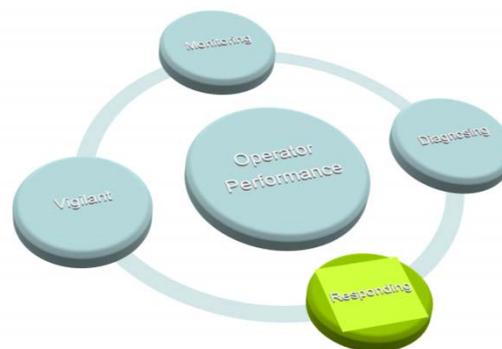


How to Develop Competence

- Visualize and anticipate possible scenarios and how to respond
- Act to avoid mishaps and incidents that *could* happen
- Consider how your competence contributes to safety for you and others

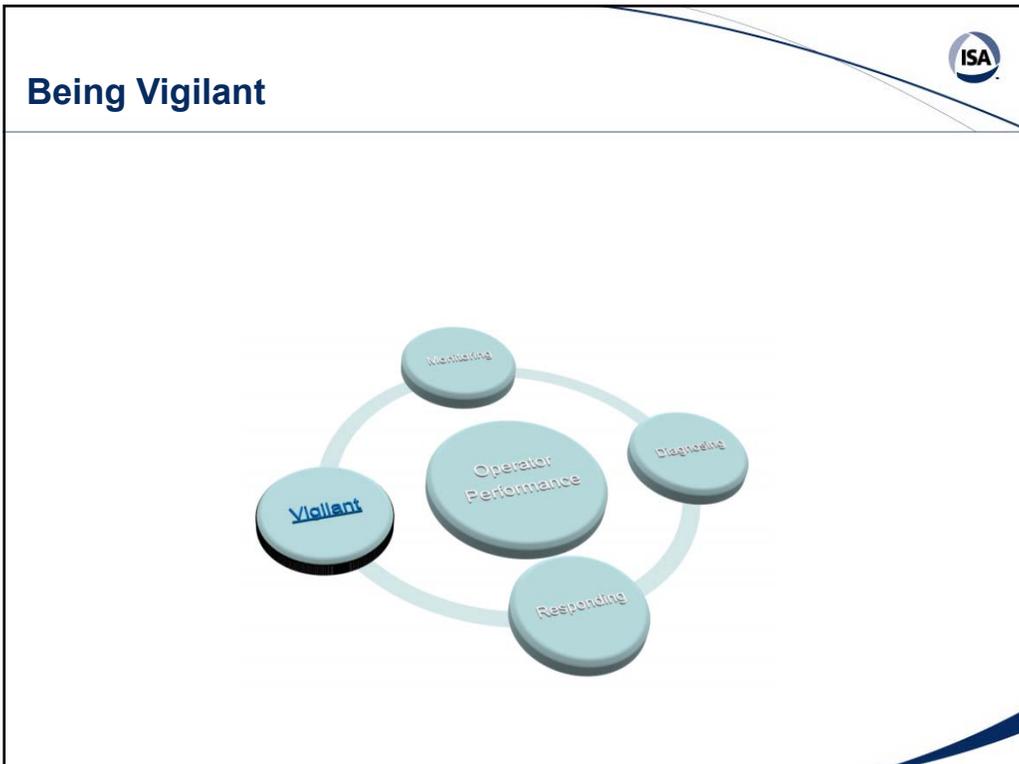
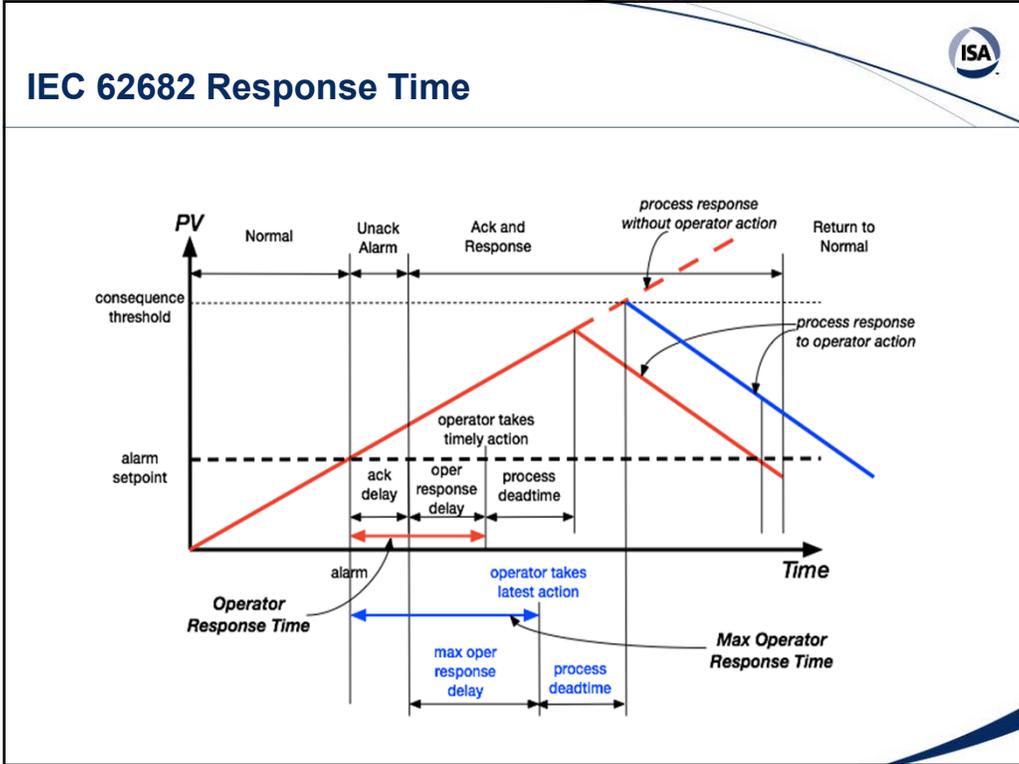


Responding



Responding –

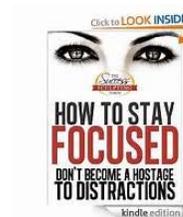
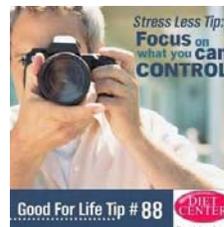
- a) the deviation from desired normal operation is detected,
- b) the situation is diagnosed, and the corrective action determined, and
- c) the action is implemented to compensate for the disturbance.



Being Vigilant



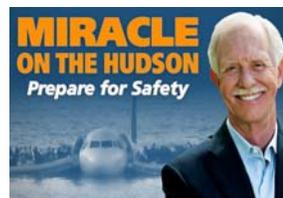
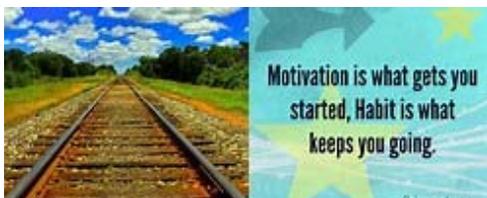
- Being present in the moment
- Dig deep, be mindful of situation
- Stay **focused** on task at hand
- Be fully engaged in safety



Being Vigilant



- Staying on point, day in and day out
- Choosing safe behavior over risky behavior
- **Preparing you to face once-in-a-lifetime moments**





Complacency

- Opposite of commitment
- Cutting corners
- Compromising on safety
- Leads to hazardous work environment



How to Demonstrate Commitment

- Be ready for work (Fit for Work)
 - Not tired
 - Not distracted
 - Not unprepared
- Lend a hand when needed
- Be thoughtfully and mindfully aware

Productivity
is never an accident.
It is always the result of a
commitment
to excellence, intelligent planning,
and focused effort.



~ Paul J. Meyer



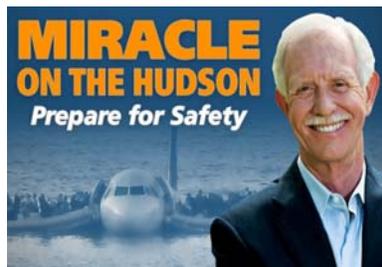
Committing to Work Safely

- Intentional
- A choice
- Commit to making safe choices every time
- Don't take shortcuts
- Don't be complacent (Coker Operators)
- Follow safety procedures every time you perform a task



Importance of Commitment

- **Never know when we'll be tested**
- Doing the little things prepares us for the big things
- Commit to safety, day in and day out



Sully's Journey to Competence



- Years of being conscientious, thorough and precise in daily duties
- Utilized **situational awareness**
- Trained for all types of emergencies
- Learned from other major airline events
- Visualized what to do to make it successful



Importance of Communication



- Less-than-safe workplace without it
- Good communication skills developed over time
- Consciously developed daily
- Using precise, respectful language in regular communication
- Contributes to safe workplace
- Prepares us for emergencies when clear communication necessary





Safety Critical Communications

Approximately 20% of incidents involve breakdowns in shift-to-shift communications. Breakdowns such as:

1. Piper Alpha will dominate our industry when situation awareness is compromised between shift workers.
2. Esso Longford
3. BP Texas City



Communication Skills to Have

- Precise, open communication
- Open-ended questions
 - Encourages full, meaningful answer
 - Begin with “why” or “how” or “tell me about...”





Human Factors in Control Room Design

- Operators sitting in the dark
- Poor environmental controls
- Poor communications and collaboration
- Disturbances
- Poor Shift Change Practices
- Distractions – phones, people walking through, staff seeking information, maintenance requiring permits
- Acoustics
- Poor Ergonomics

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Demons of SA

- Overloading of information including HMI's and Alarms
- Saliency Issues with Displays
- Short-term memory issues
- Out of loop syndrome, like sitting with your back to control system while working on IT PC.
- Attention tunneling
- Errant Mental Model
- WAFOS (Workload, Anxiety, Fatigue and Other Stressors).





Dr. Mica R. Endsley
Designing for Situation Awareness: An Approach to User-Centered Design

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A New Strategy!

- High Performance Operations as a paradigm shift from our current practices that directly affect operator performance and create pathogens for human error.
- *The vast majority (80-85%) of human errors primarily result from the design of the work situation (the task, equipment, and environment), which managers directly control.*



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Review of Final

- All accidents are preventable
 - Even Human Errors or **symptoms of deeper trouble in the system.**
- They are often simplistic in nature
- Often driven by Culture (old habits)
- Need measuring (Incident Investigation)
- Need a new Strategy, with HFE
- Need more education on Human Error
- Human Performance Improvements

Live Question and Answer Session #3



- During Q and A, questions may be asked via chat or your telephone line.
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GREATLY APPRECIATED !