

SERVICE BRIEF:

User Centered Alarm Management Services

- Alarm Rates
- Nuisance Alarms
- Alarm Priorities and Annunciation
- Alarm Statistic Gathering and Analysis and More

The Situation:

During plant upsets are the alarms coming in so fast that your console operator has someone stand next to them and press the silence button? Do your console operators pick their own alarms settings? Do you have alarms configured, but no one knows why they were set at that particular value? Do your console operators only look at the screen when the alarm goes off? Do you have pages of disabled or standing alarms? Does your site have a clearly written, well understood, and fully implemented alarm management philosophy?

Do you realize a poorly implemented alarm system can actually prevent your operators from responding to abnormal situations properly, costing you lost production, equipment damage and possible injuries?

The Solution:

User Centered Design Services provides a comprehensive array of Alarm Management Services that can be used to:

- Assess the current state of your site's alarm system, benchmarking it versus EEMUA, ISA and ASM® Best Practices
- Perform *Workshops* to educate facilities on Best Practices in Alarm System Management
- Develop a detailed *Alarm Philosophy Document* covering all aspects of Alarm Management, Rationalization, and life cycle management, including delivering *Training* to your facility on proper implementation
- Provide *Project Facilitation Services* to ensure you're alarm management implementation project stays on track and delivers real benefits to your organization

THE METHOD:

The Alarm Management Assessment and Philosophy covers the following alarm issues:

- Alarm Objective Analysis
- Alarm Rationalization
- Alarm Lifecycle Management

The Services:

Alarm System Assessment

The first step in the Assessment is to collect data on the current performance of the plant's alarm system. There is commercially available software that manages and tracks the performance of the plant alarm system. If the Client already has this type of software, we can use the existing data. If the plant does not have this software UCDS can arrange to install the appropriate software during this data gathering period. If the Client would prefer to purchase this software for continuing use UCDS can recommend Vendors.

Next, we schedule a site visit to evaluate the current alarm system. UCDS will visit the site for three days. During the visit UCDS performs interviews with multiple representatives of the departments involved in the management, implementation, use, and maintenance of the alarm system. This typically includes: Senior Management, Department Management, Instrument Engineers, Instrument Supervisors and Technicians, Process Engineers, Training Supervisors, Trainers, Procedure Writers, Control System Engineers and Technicians, Operations Supervision (all levels,) Field and Console Operators, Health and Safety, and Process Safety Management. After the site visit and data analysis a report will be generated detailing the current state of the site alarm system along with identifying specific gaps versus Best Practices.

Best Practice Workshops

We will come to your site to put on a two day workshop to review Alarm Management Best Practices with key personnel on your site. This is an excellent tool to create awareness within your organization on the methods Best-in-Class facilities are employing to make dramatic improvement in the performance of their alarm systems.

Alarm Philosophy

We will develop a comprehensive Alarm Philosophy customized for use at your site. This Alarm Management Philosophy document will be tailored for use at the site to set policy around future implementation, use, and maintenance of the alarm system.

This service begins with a three day site visit to interview stakeholders in the alarm system (similar to the Assessment above.) UCDS will then generate a draft Philosophy document for Client review.

UCDS will then put on a two day workshop at your site to educate key personnel on the content and proper implementation of the Philosophy.

Project Facilitation

Our extensive experience has shown that the key to a successful alarm management project is treating it as a project, with management commitment, goals, budgets, schedules, and allocated resources. Keeping this project on track can be a daunting task for a Project Manager who has likely never managed a project quite like this.

UCDS can provide *Project Facilitation Services* that will assist the site in setting up the project, provide periodic site visits to check in on the progress of the project, and provide unlimited telephone and email support for the project team. UCDS will visit the site for a two day kickoff meeting, followed by two day meetings each quarter for the next year to assess progress.

It is common for a Client to contract more than one of these services, and site visits can be optimized to minimize cost and Client manpower commitment.

Benefits:

A properly implemented alarm system can reduce operator work load, improve situational awareness and aid the operator in preventing minor deviations from becoming major incidents. A poorly implemented system adds to workload, increases frustration, stress, and confusion, and can ultimately impact safety, reliability, production, and profitability. The Alarm Management Services provide a rational and structured basis for ensuring all areas of importance relating to the alarm system are successfully addressed.

Related Services:

Clients who are interested in evaluating and upgrading their alarm system are also frequently interested in doing the same to their Human-Computer Interface. User Centered Design Services offers a ***Human-Computer Interface Services*** to satisfy this need. Please see the Service Briefs for more information about this service.

Additionally, there is frequently a desire to upgrade the operators console to further incorporate a high level of human-factor design in the console operator environment. User Centered Design Services also offers ***Console Design*** services. Please see the ***Engineering Services*** Service Briefs for more information on this service.

SERVICE BRIEF:

User Centered Console Operator Staffing Assessment

The Situation:

Do you ever wonder how many console operators you really need? Are your console positions equally loaded? Can you reduce the number of console operators and still safely operate the plant?

Industry comparisons indicate you have too many operators, but the Union screams anytime you discuss staffing reductions. The only guideline you have is that each operator should have between 200 and 280 loops, but no one knows where this guideline originated! You realize that a loop on a fast acting unit like a cat cracker is more work than a loop on a wastewater plant, but how do you quantify the difference?

An alternate method frequently used by other human-factor consultants in assessing workload is the time-in-motion study. It employs an old-fashioned task analysis along with random sampling to measure workload by observation. Unfortunately those being observed often changed their behavior and look busy because someone is observing them, or the observers themselves do not take into account the level of training and familiarity with displays and their navigation. The method does deliver information, but it is often biased. For example, in observing three identical Crude Units, one appeared to have a higher workload because during the observation period a process upset occurred. In truth, the workload is the same on all three units.

The Solution:

User Centered Design Services has developed a methodology that truly measures the operator's workload. This method is broad-based, fact-centered, highly objective, immune from the bias of daily problems, and comparable across the plant and across the industry.

THE METHOD:

The method is based on a three part model which includes Equipment Complexity, Interaction Complexity, and DCS Complexity.

The first model is Equipment Complexity. The console operator workload is impacted by the type and complexity of the equipment being operated. A highly dynamic reaction process is much more difficult to

operate than a slow moving tank farm. To account for these variations, we assign a score to different types of process equipment. A simple pump or heat exchanger has a low score while reactors and complex distillation columns have high scores. For each unit we develop an equipment model and determine a score.

The second model is Interaction Complexity. The unit performance, and consequently the console operator workload, is significantly influenced by upstream and downstream units. A unit that has upstream and downstream tankage, and has stable utilities is much easier to operate than one that has hot feeds, sends products to downstream units, and is highly dependent on dynamic utility systems. To accurately measure the relative complexity of operating a given unit, we consider the number and type of interactions it has with the rest of the facility. We assign a score to each significant input, output and utility for each unit. This score is weighted to account for how dynamic the stream is, and how significant an impact it has on the operation of the unit. Streams between units under the control of a single console operator are set to zero, since the console operator has full knowledge and control of these interactions.

The third model is DCS Complexity. The DCS system extrinsic complexity (as measured by its observable behaviors and database examination) also has a significant impact on operator workload. Poor DCS performance often contributes to plant incidents, although it is not always recognized. This effect can come from poor alarm management, poor graphic design (Human Computer Interface), poor graphic navigation, poor tagging conventions, advanced control that does not promote plant stability during upsets, poor control valve maintenance, poor regularity PID control or loop tuning, non-linear control with linear algorithms, a badly trained operator making poor moves without a clear strategy, and a number of other weaknesses. To model the impact of the DCS performance on the console operator work load we calculate a score using the following data: operator changes, number of standing alarms, alarms per minute during upsets (alarm floods), steady state alarms (normal operation), chattering alarms, the number of operator changes, the number of controllers that are not in their optimum mode, the total number of control loops and total number of configured I/O. For an older pneumatic or single loop electronic plant, we use the controller count.

Using the scores from the three models we can establish a single normalized figure so that each console can be displayed based on total workload impact across the facility. This allows a rational comparison of console positions across the site. The model also provides us with the ability to mix and match units and generate fact-based

case studies of possible realignment and consolidation cases. Several scenarios can be developed and workload predicted. We can also use this model to determine the additional workload created by a new unit and determine the best console position to take on the additional work load.

We can also use the scores from the models to benchmark the Client's consoles against their peers, industry standards, and best in class performers using our extensive database of console loadings. This provides an objective and rational benchmark for analyzing staffing realignments and consolidations.

The Process:

The typical process for performing a Console Staffing Assessment starts with a few preliminary conversations to determine the particulars of the study. Our methodology can be applied to a single console, an entire facility, or all facilities throughout a Client's system. The study can be done openly (including interviews with operators), or discretely (with interviews only with management and supervision) depending on the client's situation.

Data Collection. The Client needs to provide the following:

- Basic site data including the number and type of units, the current operations team structure (who works where and who controls what.)
- A complete set of current P&ID drawings for the Equipment Complexity model. We can use PFDs, but prefer P&IDs. Some consultation with engineering should be budgeted to answer questions relating to the drawings. This is typically not more than a few hours of the Client's time.
- A preliminary diagram showing the significant input, output, and utility streams for each unit. This information also can be noted on the PFDs.
- Gather and provide the DCS performance data. If the Client does not have software to gather this information, UCDS can make arrangements, at a minor additional cost, to have software provided for the study period.

After this initial data is collected and reviewed we will schedule a site visit. The number of UCDS personnel and the duration of the visit will vary depending on the size of the facility and the scope of the study. Site visits typically range from one to two weeks and require two UCDS personnel. During the site visit UCDS will interview Management, Supervision, Engineering, and Operators. These interviews are typically an hour long and will confirm the data received and search for issues that would impact console operator performance but would not be evident from drawings. We prefer to interview Operators at their

duty stations. This puts the operators more at ease and minimizes scheduling issues and overtime costs for the Client. The Client should plan on a significant number of personnel being interviewed during the visit and budget the internal cost appropriately.

After the site visit, UCDS will require a short period to analyze the data and generate a report. This report will contain a full analysis of the Client's console positions ranked across the site and benchmarked against industry. It also will provide suggestions for possible realignments or consolidations. We will include in the study a reasonable number of iterations to examine other possible realignment or consolidation cases of the Client's choice. If desired, UCDS can return to the site to present our findings to Management.

Benefits:

In a typical oil refinery study, it is not unusual to identify Console staffing reductions of 25% or more, translating into a reduction of 3 to 6 positions. At a typical \$500,000/duty station, the cost of our services can be recouped in a matter of weeks. In addition, when properly implemented (see below) these staffing reductions can result in improved labor expenses while seeing improvements in normal operation, abnormal situation management, and emergency response.

Related Services:

If the Client identifies a realignment or consolidation case they wish to pursue, we strongly recommend follow-up with a **Management System Gap Analysis** and our **Management of Organizational Change Services**. These tools provide a strong basis to ensure the proposed changes are safe and achievable and that the entire process is fully compliant with industry standards such as OSHA 1910, the Chemical Manufacturers Association *Management of Safety during Organizational Changes* and overall good Management of Organization Change practices. We can perform the **Management System Gap Analysis** at the same time as the **Console Staffing Assessment** site visit, thus saving travel and labor expenses. Please refer to the Service Briefs on these offerings for more information.

Field Operator Staffing Assessment and **Work Team Design Assessment** Briefs also are available for additional services if the Client desires to extend this type of study to outside operators, or the overall work team make-up.

SERVICE BRIEF:

User Centered Control Building Conceptual Design

The Situation:

Are you thinking it's time to invest in your controls and control buildings?

Maybe the current control rooms in your facility are old, and in need of extensive refitting. Maybe API-RP752 says your existing buildings are too close to the units and aren't built to blast resistant standards impacting occupancy thresholds. Maybe you're about to invest in a major reinstrumentation project and would like to optimize your spending. Perhaps you're thinking about building a central control room. Maybe you have heard about competitors building large centralized control rooms with large off-workstations creating a theater style building bringing the big picture back to control operators. You know a lot of research has been done on managing abnormal situations and on getting the most out of your console operators, and you would like to make sure you take full advantage of it.

You have a good Project engineering group but they aren't experts in this type of project. You have a person who did a control room project and is considered an expert, but that experience is based on one project. And that project was never reviewed for what works well and what doesn't, such as poor traffic flows, HVAC issues, bad lighting, poor console adjacencies, poor room adjacencies. Who has the resources to become an expert in field that you only invest in every 30 years? There *has* to be a better way of handling this type of project but how? What should you do? What should you *not* do? How do you make sure you're getting the highest return on your investment and getting the biggest benefit at the lowest cost? What Industrial Standards, Guidelines and Practices should be considered? You don't want to create control rooms that have problems similar to your existing buildings. With

24-hour shift operations you require the best practices around ergonomics and human factors to ensure safe production.

The Solution:

Driven by today's demands for safer, more reliable, cost effective and efficient operations, control room designs are relying more heavily on automation and centralized supervisory control. The operator however, has retained a critical role in making these systems work. With our extensive engineering experience, and working relationship with many different architectural firms, we have been involved in over a hundred control room projects ranging from small refits of existing buildings to construction of state of the art distributed and consolidated control rooms.

User Centered Design Services can help you through the evaluation process by:

- Developing a shared vision by defining the needs and requirement of your organization
 - What is Management's vision for the site
 - Who's in the building and who's out?
 - What sort of facilities should be included?
 - What types of fatigue countermeasures should be used?
 - What rooms are required?
 - What should the room adjacencies be?
 - What do you do with your existing buildings?
- Determining the best locations, number and style of control room(s)
 - Safety, environmental, security
 - Local or remote
 - Single central control room or multiple remote control rooms
 - Functional layout or theater layout
 - Within the battery limits or outside
- Reviewing your current practices and how they will be impacted by a new facility
 - Expectations of Operators
 - Organization and Culture
 - Impact on existing Management systems (procedures, training...)

- Identifying areas to improve the operator's ability to detect, diagnose and respond to an abnormal situation.
 - Impact and potential re-use of existing console furniture
 - Ergonomics
 - HVAC and Lighting
 - Noise control
 - Traffic flow

The Process:

Our process begins with a few phone conversations to determine the scope of the project, and then we schedule a site visit. Typically, two representatives from UCDS will visit the site, depending on site size and project scope. These visits usually last a week although they may run longer or be staffed by more UCDS personnel if required.

During this initial visit, UCDS will conduct extensive interviews with a wide cross section of plant personnel from Senior Management to plant operators. This process generally will involve 60+ interviews. All interviews usually require an hour to perform and cover day organization and shifts. We prefer to interview Operators at their duty stations. This puts the operators more at ease, allows them to physically show us things important to them, and minimizes scheduling issues and overtime costs for the Client. We recommend early involvement of the Union, if applicable; we have developed a strong collaborative working relationship with PACE representatives and members over previous studies and frequently met with Union Reps at the start of the project.

After the site visit, UCDS will require a short period to analyze the data and generate a report. This report will contain a full analysis of the results of the interviews, including recommendations on dozens of areas to be considered during the project. Also included will be a conceptual bubble diagram of possible new building room concepts and adjacency relationships for all identified rooms in the building, preliminary room sizes if known, and an order of magnitude budget for the next phase of the project. This is not a full list and does not have the details for room size, which would be difficult to do as the customer may not know space requirements such as how many computers in the

computer room at this point in the project but is good for a \pm 30% budget figure. We allow for a couple of edits of this document after site review. If desired, UCDS can return to the site to present our findings to Management.

Benefits:

This process provides a structured, rational way to begin a project that most facilities may attempt only once in twenty or thirty years. User Centered Design Services brings knowledge and experience from a broad industrial base to bear on your facility. A properly designed facility can increase operator performance, reduce work-related stress, reduce human errors, improve safety, reduce upsets, slowdowns and shut downs, and contribute significantly to the bottom line of the plant.

Related Services:

Frequently when a Client is considering a project of this type, they also are interested in reevaluating their staffing levels. User Centered Design Services is uniquely qualified to help clients identify potential operator rationalization and consolidation cases for both console and field operators by performing a **Console Staffing Assessment** and a **Field Operator Staffing Assessment**. We also can assist in helping determine the optimum make-up of the operations work team through a **Work Team Design Assessment**. Please see the Service Briefs for more information on any of the services.

The Conceptual design site visit also offers a good time to perform a **Management System Gap Analysis**. This analysis can identify other potential areas of opportunity for improvements in the plant operation. When combined with the Conceptual design visit, savings can be realized in travel and labor costs.

User Centered Design Services also can assist in developing the project justification and help to setup the project team. More information is available in the **Engineering Services Brief**.

SERVICE BRIEF:

User Centered Control Building Detailed Design

The Situation:

You want to build a new control building. You have an idea of how many people and what rooms are required, but you don't have any idea of adjacencies, actual room sizes and details of what functions the rooms need to support. If you call in an architect they will provide a questionnaire to address these issues, however, the question are designed to get an answer, not ensure that the design meets the needs of the people. An architect may ask a client if he needs a training room and the client says, "yes." The architect then designs a room based on how many people were in the control room. However, the Architect did not ask how training was to be done; or how the room would be used during different situations; or if the room would be used for other activities; or what is the vision for training in the future, such as cross-training; or how it will address console and field operator collaboration, procedure development and testing. You made mistakes with your existing building and don't want to have to live with the results of a poorly implemented project for the next 30 years.

The Solution:

UCDS has been involved in over a hundred control room projects ranging from small refits of existing facilities to construction of state of the art consolidated control rooms. We work with multiple industries in multiple countries and have captured what works well and how to share learning events which is of benefit to our customers.

Front-end loading the project has been identified as a best practice by 1st quartile companies. This will involve production of a Functional Specification to ISO 11064 standards for Ergonomic Design of Control Buildings.

User Centered Design Services can help you through the process of making sure the Architect

considers how the building will function, as well as how it looks. The Detailed Design phase includes a site visit to review preliminary plans with facility personnel and gathering information for a Functional Design Specification Document. The Detailed Design document provides specifications that allow any Architect to design a control room that will include Best Practices in layout and design. Further, our Detailed Design contracts terms require User Centered Design Services to be involved for the entire design phase of the project, typically an 18 month process. UCDS will be available for consultation with the Client, Architect, or other contractors involved in the design phase of the control room project for one fixed fee.

The Detailed Design service includes specifications on the following areas:

- Primary and secondary user requirements
- Room types, sizing and functions
- Building and room adjacencies
- Console arrangements and adjacencies based on process interactions and good communication and collaboration strategies
- Ergonomic Console Design and work process requirements
- Shared equipment arrangements
- Fatigue countermeasures
- Recommendations in collaboration with your Architect and their design contractors on:
 - Flooring
 - Finishes
 - Lighting
 - HVAC system
 - Noise
 - Use of interior glazing
 - Traffic flow
 - And many more...

It also includes an Operating Philosophy document. This is a template document that records the How, Why and When decisions made during the control building project. This covers topics such as plant startup strategy and functional relationships between new and old control rooms and backup control strategies in case of outages or common mode failures. This document should be used to remind the organization why things



were done the way they were, and ensure future changes do not work against the original intent of the project.

The Process:

Our detailed design service typically picks up after completion of the **Control Building Conceptual Design**, although it is not a requirement. If the conceptual Design phase is not done in conjunction with UCDS, a preliminary meeting most likely will be required to allow UCDS to get up to speed with the project goals.

After the Conceptual Design the Client can begin the process of choosing an Architect while UCDS generates a Detailed Design report based on interviews with a wide cross-section of the buildings primary and secondary users. Our report will provide the Architect with details and specifications critical to designing a building that encompasses all Best Practices and provides a +/- 30% budget figure. These details will also allow an architect to develop 90% construction drawings to provide a +/- 10% estimate.

This visit typically lasts for a week, and one or two representatives from UCDS will visit the site. During this process UCDS will perform interviews with all stakeholders in the control building project including: Senior Management, Department Management, Instrument Engineers, Instrument Supervisors and Technicians, Process Engineers, Training Supervisors, Trainers, Procedure Writers, Control System Engineers and Technicians, Operations Supervision (all levels), Field and Console Operators, Health and Safety, Process Safety Management, and Business Planning. These interviews are typically an hour long. We prefer to interview Operators at their duty stations during morning and evening shifts. This puts the operators more at ease, and minimizes scheduling issues and overtime costs for the Client. The Client should plan on a significant number of personnel being interviewed during the visit, and budget the internal cost appropriately.

UCDS also provides adjacency requirements for rooms and consoles and will develop a functional layout diagrams for review by the stakeholders.

We then provide this information in the form of a Detailed Specification, to your Architect who will turn the sketches into code compliant drawings

After the Architect has developed a few options for the building layout, UCDS will make a site visit to review the plans with all levels of facility personnel, especially all those interviewed in the first phase. This allows the gathering of feedback, ensures the concerns of all stakeholders are addressed, and helps to educate, sooth fears and increase overall project buy-in. A 3D video walkthrough can be provided.

As the Client goes through the iterative process of finalizing the building design, User Centered Design Services will be available for consultation and meeting as required.

Benefits:

This process provides for any client a cost effective method to incorporate Best Practices in control room design into their new facility. This can be done for new building or retrofits of existing facilities. User Centered Design Services brings state of the art learnings from throughout industry to bear on your facility.

A badly designed project can incur costly changes, re-designs, scope creep, time delays, construction nightmares, and could have implications on the effectiveness of the plant for the next 30 years. A properly designed facility can increase operator performance, reduce work-related stress, reduce human error, improve safety, reduce upsets, slowdowns and shut downs, and contribute significantly to the bottom line of the plant.

Related Services:

User Centered Design Services can also help Clients in selecting an Architect for their project. Our extensive background in these types of projects makes us extremely well qualified to help select the most cost effective Architect while still providing a Best Practice solution. Please see the **Engineering Service** Briefs for more information on this service.

SERVICE BRIEF:

User Centered Engineering Services

Other Services:

User Centered Design Services offers other engineering services to aid clients in implementing ASM Best Practices at their sites:

CONSOLE DESIGN:

User Centered Design Services will evaluate your current operational needs and design new or revamped consoles or off-work stations that fully integrate the latest in human factor engineering, ergonomics, and EEMUA and ASM Best Practices. This service is included in a **Control Building Detailed Design** engagement.

FEASIBILITY STUDIES:

User Centered Design Services can help you begin the process of determining if your automation upgrade project is feasible. We can bring our extensive expertise to your site to help determine the needs of your facility, the scope of the project, the best way to integrate Best Practice solutions, and the most cost effective solution. We perform this study with the aim of developing a justification to aid in your Front End Loading process.

AUTOMATION UPGRADE CONSULTATION:

User Centered Design Services has had experience with a tremendous number of control upgrade projects. We can provide an expert independent evaluation of the pro's and con's of upgrade concepts and aid the Client in selecting the most appropriate upgrade approach for the site. Since we have no alliances with any vendor, but work well with all of them, you can be assured of an unbiased evaluation.

ARCHITECT AND VENDOR EVALUATION:

User Centered Design Services also has had experience with a wide variety of Architects and control component vendors. We provide an expert independent evaluation of Architects, instrument and control vendors, I&E contractors, graphic implementers, advanced application software vendors, operations and business support software, control console and furniture vendors, overview screen technology suppliers, and plant communication equipment suppliers. Since we have no alliances with vendors of these products or services, but work well with all of them, you can be assured of an unbiased evaluation.

EXPERT WITNESS:

If you find yourself in need of expert testimony User Centered Design Services can help. As a recognized expert in the field of safety systems and human factors, Ian Nimmo is available to assist you in your legal efforts.

WORKSHOPS:

If you're not ready to fund a major study but are at the beginning of a new control building project, have uncertainties about the effectiveness of your current control room practices, or you're wondering how the ASM Best Practices can work in your facility; a UCDS workshop may be exactly what you need. User Centered Design Services will come to your site and conduct a Workshop for your staff. Workshops typically run 2 to 4 days and educate site personnel on the latest research and ASM Best Practices. We'll discuss the benefits and advantages of these practices and how they can be implemented on site. In the process we help facilitate the creation of a vision that is shared among all the key members of your organization.

Typical workshop topics include Control Building Projects, Alarm Management, Human-Computer Interface, and Human Factors. Custom workshops are available on request.



TRAINING:

If you're looking for more detail than a Workshop, User Centered Design Services can come to your site and provide detailed training for your personnel on all aspects of ASM Best Practices. Typical training topics include Control Building Projects, Alarm Management, Human-Computer Interface, and Human Factors. Custom training is available on request. Through our training partner, TTS, we can offer training on any topic of interest in a production facility to any level of the organization from Management to Operators.

JOB TASK ANALYSIS:

User Centered Design Services will provide an analytical process for determining the specific behaviors required of humans in operator-machine systems. This involves determining the detailed performance required of people and equipment, and determining the effects of environmental conditions, malfunctions and other unexpected events on both. We analyze the behavioral steps to be performed by people within in terms of

- 1) Information presented to, and received by, the workers;
- 2) Their processing of that information (and previously stored information, goals, intentions, etc.) to interpret the system status and to decide what action, if any, to take; and
- 3) Required worker inputs to the system, which include other workers as well as the equipment.

CUSTOM SERVICES:

As a small responsive consulting company, we pride ourselves on personalized treatment of each Client. If you see something in our briefs or on our Web site that interests you, but it's not exactly what you had in mind, we are happy to customize any of our services to fit your needs and your budget. Please contact us to discuss how we can help your facility achieve Operations Excellence.

SERVICE BRIEF:

User Centered Field Operator Staffing Assessment

The Situation:

Traditionally, Field Operator Staffing levels have been determined by various methods that tend to be highly subjective and lead to overstaffing.

In many facilities the staffing levels are set through evolution of the process and negotiation with the labor force. This method has obvious drawbacks, since the workforce typically is not concerned with optimizing expenses.

Some human factors consultants use, instead, time and motion studies. This method employs old-fashioned task analysis along with random sampling to physically measure workload by observation. The work is then categorized into groups such as administration, inspection, laboratory, maintenance, operational tasks, etc. Unfortunately, those being observed often change their behavior and look busy because someone is observing them, or the observations do not take into account all aspects of the job being studied. While this method may deliver information, it is too easily biased.

The Solution:

User Centered Design Services has developed a methodology that truly measures the operator's workload for both dedicated field operators and inside/outside operators, or those with both field and control duties. This method is broad-based, fact-centered, highly objective, immune from bias by daily problems, and comparable across the plant and across the industry.

THE METHOD:

Our method is based on a three-part model that includes Equipment Complexity, Controls and Automation, and an Additional Work Study.

First is the Equipment Complexity model. The field operator workload is affected by the type and complexity of the equipment being

monitored. Large amounts of rotating or fired equipment or equipment that handles highly toxic materials makes an outside job more difficult than tending drums and columns. To account for this variation, we assign a score to different types of process equipment and different classifications of materials being processed. This metric accounts for normal time required to perform monitoring and minor maintenance. For each unit, we develop an equipment model and determine a score.

The second model is Controls & Automation Impact, which considers the operator's role either as a dedicated or inside/outside position, and the level and quality of the automation. The level of automation in a plant also has a large impact on the human resources required to operate the plant safely. To estimate the level of automation in the plant, we compare the amount of equipment under the operators' control and the number of controllers in the area. We generate a numerical score for each unit.

The third model is Additional Work Study. Some duties assigned to field operators are not well represented simply by the equipment under their control. To account for this, we interview Operations personnel, preferably supervisors and hourly operators, to catalog significant additional tasks assigned to the field operators. These might include loading or unloading trucks or rail cars, analyzing unit samples, regenerating dryers, cleaning or replacing process filters, taking unusual amounts of equipment readings, taking unusually large numbers of process samples, long travel times to equipment, or many other variables. Since this list is derived from discussion, and verified through supervision, it is far less likely to be biased.

By combining the scores from the Equipment Complexity and the Controls & Automation Impact studies with the time derived from the Additional Work Study we determine a single, normalized value for each position. These scores provide a rational basis for comparison across the facility. The model also provides us with the ability to mix and match units, and generate fact-based models for possible realignment and consolidation cases. We can develop multiple scenarios with predictable workload factors. We can also use this model to

determine the additional workload created by a new unit, and determine the best field operator position to take on the additional workload.

Using the scores from the models, we also can benchmark Client positions versus their peers, industry standards and best in class performers using our extensive database of workloads. This provides an objective and rational benchmark for analyzing staffing realignments and consolidations.

The Process:

The typical process for performing a Field Operator Staffing Assessment consists of a few preliminary conversations to determine the particulars of the study. We can apply this methodology to a single position, an entire facility or all facilities throughout a Client's system. The study can be done openly (including interviews with operators), or discretely (with interviews involving only management and supervision) depending on the client's situation.

Data Collection. As the Client, you will need to provide the following:

- Basic site data, including the number and type of units, the current operations team structure (who works where and who controls what).
- A complete set of current P&ID drawings for the Equipment Complexity model. We can use PFDs, but prefer P&IDs. Some consultation with engineering should be budgeted to answer questions relating to the drawings. This is typically not more than a few hours of the Client's time.

After this initial data is collected and reviewed, we will schedule a site visit to perform the Additional Work Study. The number of UCDS personnel and the duration of the visit will vary depending on the size of the facility and the score of the study. Site visits typically range from one to two weeks and require two UCDS personnel. During the site visit, UCDS will interview Management, Supervision, Engineering and Operators. These interviews are typically an hour long. We prefer to interview Operators at their duty stations. This puts the operators more at ease, and minimizes scheduling issues and overtime costs for the Client. The Client should plan on a significant number of personnel being interviewed during the visit, and budget the internal cost appropriately.

After the site visit, UCDS will require a short period to analyze the data and generate a report. This report will contain a full analysis of the Client's field operator positions ranked across the site and benchmarked versus industry. It also will provide suggestions for possible realignments or consolidations. A reasonable number of iterations to examine other possible realignment or consolidation cases of the Client's choice are included in the study.

Benefits:

In a typical oil refinery study, it is not unusual to identify field operator staffing reductions of 10% or more. At a typical \$500,000 duty station, the cost of our services can be recouped in a matter of weeks. In addition, when properly implemented (see below), these staffing reductions can result in reduced labor expenses while seeing improvements in normal operation, abnormal situation management and emergency response.

Related Services:

If the Client identifies a realignment or consolidation case they wish to pursue, we strongly recommend follow-up with a **Management System Gap Analysis** and our **Management of Organizational Change Services**. These tools provide a strong foundation to ensure the proposed changes are safe and achievable, and that the entire process is fully compliant with industry standards, such as OSHA 1910, the Chemical Manufacturers Association *Management of Safety during Organizational Changes*, and overall good Management of Organizational Change practices. We can perform the **Management System Gap Analysis** concurrently with the **Field Operator Staffing Assessment** site visit, thus saving on travel and labor expenses. Please refer to the Service Briefs on these offerings for more information.

Console Staffing Assessment and **Work Team Design Assessment** Briefs outline additional services that are frequently of interest to clients along with the **Field Operator Staffing Assessment**.

SERVICE BRIEF:

User Centered Field Shelter Design

The Situation:

In the past, all control was done from field shelters. A control system upgrade has enabled the site to move to a new control facility. The field shelters will still be used by field operators for important functions such as maintenance coordination, issuing work permits, sampling, new employee training, but are poorly designed for these functions. The main controls are transferred to the new control room, but maintenance and backup control view is available in the field shelter and is used for diagnosing, testing, and training. With the removal of the console operator it is important to re-design the room for the field operator functionality. These renovations may include hardening the building.

The Solution:

UCDS has in-depth experience in designing control rooms and modifying existing field shelters. Our process is compliant with the ISO 11064 Ergonomic Design Standard for Control Buildings. We interview management, supervision and a significant group of the operators to understand functional requirements, what works well in the existing environment, and identification and correction of problems with the existing design.

Some customers prefer to walk away from their existing building and move the field operators into a Modular Blast Resistant Building. Our process helps facilitate this move and provides a detailed design for the Modular Building manufacturer.

We help identify if you can rationalize many field shelters into a smaller number of more centralized field shelters. One site went from 16 field shelters to 3 new field shelters, utilizing modular buildings, located in strategic locations.

The design service includes specifications on the following areas:

- Best locations for new buildings
- Primary and secondary user requirements
- Room types, sizing and functions
- Building and room adjacencies
- Functional adjacencies based on work flow interactions and good communication and collaboration strategies
- Design and work process requirements
- Shared equipment arrangements
- Fatigue countermeasures
- Recommendations in collaboration with your Architect and their design contractors on:
 - Flooring
 - Finishes
 - Lighting
 - HVAC system
 - Noise
 - Use of interior glazing



- Traffic flow
- And many more...

The Process:

The first step in the process is identifying the required number and location of field shelters required. This is accomplished by reviewing process safety information, site plans, and API RP752 reports and then discussing renovation, remodel, or alternative solutions with plant personnel.

Once the number field shelters has been established, we spend time capturing requirements from managers, supervisors, operators along with other secondary users of the building such as maintenance, planners, and laboratory staff. UCDS will ensure rooms are designed for functional requirements and good collaboration and communication, whilst addressing traffic flow through the building and minimizing disturbances. The building will also address issues such as responding to emergency situations and how operators use equipment like respirators and specialized PPE.

We develop design alternatives and solicit feedback from the users. We then integrate this feedback into a final design and generate a $\pm 30\%$ budget estimate, or $\pm 10\%$ for modular buildings. To modify an existing building to code and to develop a $\pm 10\%$ estimate an architect will need to be involved. This $\pm 10\%$ estimate may require local planning permission, upgrading buildings to today's building codes, and developing construction drawings.

As the Client goes through the iterative process of finalizing the building design, User Centered Design Services will be available for consultation as required.

Benefits:

This process provides for any client a cost effective method to incorporate Best Practices in control room design into their facility. This can be done for new building or retrofits of existing facilities. User Centered Design Services brings state of the art learning's from throughout industry to bear on your facility.

A badly designed project can incur costly changes, re-designs, scope creep, time delays, construction nightmares, and could have implications on the effectiveness of the plant for the next 30 years. A properly designed facility can increase operator performance, reduce work-related stress, reduce human error, improve safety, reduce upsets, slowdowns and shut downs, and contribute significantly to the bottom line of the plant.

Related Services:

User Centered Design Services can also help Clients in selecting an Architect for their project. Our extensive background in these types of projects makes us extremely well qualified to help select the most cost effective Architect while still providing a Best Practice solution. Please see the **Engineering Service** Briefs for more information on this service. This service can also done in conjunction with our **Conceptual and Detailed Control Building Design Services**.

User Centered Design - How the Pieces Fit

A Typical Scenario:

Does this sound familiar?

- You have an older production facility with control hardware from different vendors ranging from pneumatic to distributed control. You want to upgrade your DCS equipment so you can increase reliability, reduce maintenance costs and implement advanced control, but you're not sure what the best equipment to buy is.
- Your plant is split into multiple control rooms, each serving one or two units. The buildings are old, some are in poor condition, and they all place your operators too close to the unit in case of fire, explosion or toxic release. Your Safety people are saying you have to spend a lot of money replacing, relocating or upgrading the buildings.
- Benchmarking surveys are telling you that you have too many operators. Upper Management is looking for staff cuts to get to first quartile, but no one knows can see a way to get to those levels without compromising safety. And the Union issues...
- You're the person who has to figure out the strategy, find the most cost effective path, justify a positive payout, and get the money approved.

How We Can Help:

User Centered Design Services can best serve a client when we're brought in early in the project. We typically begin the process by putting on a **Workshop**. This introduces concepts and educates the site Management on the benefits of implementing Best Practices.

After the site has had some time to consider the potential, and has decided to get more information on how these Best Practices can work at their sites, we come on site to perform a **Feasibility Study** and a **Management System Gap Analysis**.

During this phase we will perform a detailed evaluation of your facility and highlight areas of opportunity for implementation of Best Practices. We will help to assemble an overall plan which encompasses all aspects of plant operation. We then aid in developing a justification to present to management for approval in your Front End Loading process.

After approval of the overall plan, we begin to focus in on specific areas of improvement.

- In the **Control Building Conceptual Design**, we look at the best ways to improve your control building environments, whether it's modifying your existing buildings or constructing a new central control room.
- We evaluate your staffing arrangement through the **Console Operator Staffing Assessment**, **Field Operator Staffing Assessment**, and **Work Team Design Assessment**. These activities cover the number of operators required to safely operate the plant as well as the best structure for the Operations department.
- We take an in-depth look at your control system design through our **Alarm Management Services** and our **Human-Computer Interface Services**.
- Through the **Field Shelter Design Service** we can help you upgrade your field operators environment by greatly improving its functionality.

Finally we have the detailed implementation steps.

- The **Control Building Detailed Design** step provides everything you'll need to ensure that any architect can design a control room space that fully embraces Best Practices.
- After the staffing assessments are completed, we move into **Management of Organizational Change Services**. This is where the proposed staffing changes are scrutinized to insure that safety and reliability are not compromised.
- We can also share our expertise with the project team by performing **Architect and Vendor selection** and **Automation Upgrade Consultation**

Details about all these services are available through our Service Briefs or online at MyControlRoom.com

SERVICE BRIEF:

User Centered Human-Computer Interface Services

The Situation:

Do your operators claim they need 10 screens to operate the plant? Do your graphics look cluttered? Are they more colorful than a carnival? During an abnormal situation are your operators rapidly jumping between screens searching for the information they need? Were your graphics developed page-for-page from the P&ID's? Do your graphics incorporate the latest research into cognitive processing?

Do you realize a poor human-computer interface can actually prevent your operators from responding to abnormal situations properly, costing you lost production, equipment damage, and possible injuries?

The Solution:

User Centered Design Services offers a Human-Computer Interface Services that will:

- Assess the current state of your site's human-computer interface, benchmarking it versus ASM® recommendations and industry Best Practices.
- Perform *Workshops* to educate facilities on Best Practices in Human-Computer Interface design
- Develop a detailed Human-Computer Interface *Style Guide* covering all aspects of Best Practices in situational awareness and cognitive processing, including delivering *Training* to your facility on proper implementation

THE METHOD:

The Human-Computer Interface Assessment, and Style Guide, covers the following issues:

- Navigation
- Display Hierarchy
- Use of Colors
- Window Management and Number of Screens
- Integration of Trend and Alarm Information
- Integration of Other information

- Identification of Specific Display Objects
- Intra-Display Communication and Coordination
- Overview Display Design

The Services:

Human-Computer Interface Assessment

We schedule a site visit to evaluate the human-computer interface system. Typically, one or two representatives of User Centered Design Services visit the site for three days. During the visit UCDS performs interviews with multiple representatives of those departments involved in the management, implementation, use, and maintenance of the human-computer interface. This typically includes: Senior Management, Department Management, Instrument Engineers, Instrument Supervisors and Technicians, Process Engineers, Training Supervisors, Trainers, Procedure Writers, Control System Engineers and Technicians, Operations Supervision (all levels,) Field and Console Operators, Health and Safety, and Process Safety Management.

Following the site visit we generate a report detailing the current state of the site human-computer interface along with identifying specific gaps versus Best Practices.

Best Practice Workshops

We will come to your site to put on a two day workshop to review Human-Computer Interface (HCI) Best Practices with key personnel on your site. This is an excellent tool to create awareness within your organization on the methods Best-in-Class facilities are employing to make dramatic improvement in the performance of their HCI.

Human-Computer Interface Style Guide

We will develop a comprehensive Human-Computer Interface *Style Guide* customized for use at your site. This *Style Guide* document will be tailored for use at the site to set policy around future implementation, use, and maintenance of the HCI system.

This service begins with a three day site visit to interview stakeholders in the HCI system (similar to the Assessment above.) UCDS will then generate a draft *Style Guide* document for Client review.

UCDS will then put on a two day workshop at your site to educate key personnel on the content and proper implementation of the *Style Guide*.

A *Style Guide* is a document that specifies the parameters for the HCI. It covers the items mentioned above, such as navigation and use of colors, which govern the look and feel of the user displays. It works in conjunction with the Object Library to develop control system displays.

The Object Library is a combination of written documents and computer code that define the actual symbols, or objects, used on the displays. The Object Library is typically purchased from the control system vendor, or it can be commissioned from a system implementer.

As part of the *Style Guide* Service, we will be happy to comment on the compliance of the proposed Object Library with the Style Guide. We are also available, as a separate activity, if the Client would like us to develop a custom Object Library in conjunction with a system developer.

Staged Upgrade

Most companies have a large investment in old technology, and traditional interfaces. Making a dramatic change is often very expensive, time consuming, and only a major change in technology allows the site to upgrade the current displays. To assist clients in making more cost effective changes outside the traditional DCS upgrade project, we offer a migration strategy service. This migration strategy sets a path forward that allows implementation of best practices, over time, within normal system maintenance budgets.

It is common for a Client to contract more than one of these services, and site visits can be optimized to minimize cost and Client manpower commitment.

Benefits:

A poorly implemented interface adds to workload, increases frustration, stress, and confusion, and can ultimately impact safety, reliability, production, and profitability. A properly implemented human-computer interface can reduce operator work load, improve situational awareness, and aid the operator

in preventing minor deviations from becoming major incidents.

A properly implemented Human-Computer interface will also work hand in hand with alarm management initiatives. Better presentation of information to the operator improves overall situation awareness. This helps offset the perception operators frequently have that elimination of alarms from the DCS will reduce their ability track the status of the plant.

Recent research has identified that well implemented human-computer interface can improve operator performance in problem detection and resolution by as much as 25%. This reduces the amount of time the plant is running at less than optimal efficiency, thus improving the bottom line. This also reduces operator stress and improves employee relationships.

The Human-Computer Interface Assessment and human-computer interface style guide provide a rational and structured basis for ensuring all areas of importance relating to the human-computer interface are successfully addressed.

Related Services:

Clients who are interested in evaluating and upgrading their Human-Computer Interface are also frequently interested in doing the same to their alarm system. User Centered Design Services offers **Alarm Management Services** to satisfy this need. Please see the Service Briefs for more information on this service.

Additionally, there is frequently a desire to upgrade the operators console to further incorporate a high level of human factor centered design in the console operator environment. User Centered Design Services also offers **Console Design** services. Please see the **Engineering Services** Service Briefs for more information on this service.

SERVICE BRIEF:

User Centered Management System Gap Analysis

The Situation:

All production facilities seek to continuously improve their operation particularly in the areas of Safety, Health, Environmental, Reliability, and Profitability. The staffs at these facilities commit tremendous time, effort and capital trying to improve policies, processes and procedures to gain a competitive advantage.

But are you working on the right things? What areas are best to concentrate on? Where is your facility weak? Where is it strong? What are the best in class performers doing? How can you get there?

The Solution:

User Centered Design Services is an associate member of the Abnormal Situation Management Consortium®, Ian Nimmo was previously the Program Director for the Consortium and led all of the benchmarking studies for the consortium. Through his involvement in numerous cross-industry site studies at Power Plants, Refineries, Petro Chemical and Iron and Steel manufacturing plants, he was instrumental in setting a standard for industry and in providing the Consortium with an Effective Practices Guideline. UCDS partner John Moscatelli has extensive process plant and instrumentation experience with a practical background in Shift Team Leadership. We can bring this experience to your site in the form of a Management System Gap Analysis. For this analysis we'll visit your site, talk to your personnel and compare how existing site policies are intended to work, how those policies actually work in the trenches, and how they compare to industry Best Practice.

The ASM Consortium Effective Practices Guidelines are organized under seven practice categories:

1. Abnormal Situation Understanding
2. Management Structure and Policy
3. Training and Skill Development
4. Communications
5. Procedures
6. Control Building Environment
7. Process Monitoring, Control and Support Applications

They can deliver the following results:

- Employees understand what abnormal situations are, how often they arise, and why,
- Processes effectively minimize the impact of abnormal situations,
- Management's communications of goals, processes, and status is effective and comprehensive,
- Employees' knowledge and skills are continuously and appropriately enhanced,
- Employees work in a supportive culture, and in an appropriate and safe environment,
- Management finds opportunities to innovate and apply technologies to continuously improve, and
- The change that results from continuous improvement is well managed.

THE METHOD:

The Management System Gap Analysis performs an in-depth review of the following management systems:

- Organization & Culture
- Safety Policy & Risk Assessments
- Procedures
- Incident Investigation
- Staffing
- Operator Expectations
- Training & skill development
- Shift working practices & rotation
- LOTO
- MOC
- HazOp
- Alarm Management
- Human Interface Design
- Communications Practices
- Human Factors & Control Building Work Space Design

The Process:

The typical process for performing a Management System Gap Analysis starts with a few preliminary conversations to determine the particulars of the study. We can apply this methodology to a single facility or all facilities throughout a Client's system.

We schedule a site visit to perform the Management System Gap Analysis. Typically two representatives from UCDS visit the site. During this process UCDS performs interviews with multiple representatives from the following areas: Senior Management, Department Management, Instrument Engineers, Instrument Supervisors and Technicians, Process Engineers, Training Supervisors, Trainers, Procedure Writers, Control System Engineers and Technicians, Operations Supervision (all levels), Field and Console Operators, Health and Safety, Process Safety Management, and Business Planning. These interviews are typically an hour long. We prefer to interview Operators at their duty stations during morning and evening shifts. This puts the operators more at ease, and minimizes scheduling issues and overtime costs for the Client. The Client should plan on a significant number of personnel being interviewed during the visit, and budget the internal cost appropriately.

After the site visit, UCDS requires a short period to analyze the data and generate a report. This report contains a full analysis of the completeness of the current site policies, how those policies are implemented on site, and how those policies compare to Best Practice. If desired, UCDS can return to the site to present findings to Management.

Benefits:

This process allows Management a unique opportunity to gauge their site performance versus industry Best Practices. It will provide invaluable feedback to aid in focusing continuous improvement effort in areas where the greatest impact can be made.

Related Services:

User Centered Design Services offers additional consulting services in most of the areas covered by the Management System Gap Analysis. As gaps are identified, we can work with the Client to develop plans to bring the site up to Best Practice status.

User Centered Design Services is also uniquely qualified to help clients identify potential operator rationalization and consolidation cases for both console and field operators by performing a **Console Staffing Assessment** and a **Field Operator Staffing Assessment**. We can help determine the optimum make-up of the operations work team through a **Work Team Design Assessment**. Please see the Service Briefs for more information on our full array of services.

SERVICE BRIEF:

User Centered Management of Organizational Change Services

The Situation:

In response to significant incidents across the oil and chemical industries a number of different regulations and recommendations have appeared requiring extensive study and documentation of any changes that are made to staffing levels, staffing arrangements and job duties in a production facility. Industry standards, such as OSHA 1910, the Chemical Manufacturers Association *Management of Safety during Organizational Changes*, ordinances in Contra Costa County, California, UK Health and Safety Executive regulations, as well as overall Best Practices in Management of Organizational Change, all place extensive requirements on production Companies. It can be difficult to manage these requirements and ensure changes are well conceived, well executed and safe.

The Solution:

User Centered Design Services has developed services around our methodology that are fully compliant with all these Best Practices. Our methodology provides an objective framework to study proposed changes, and ensures that changes are well conceived, well executed and safe. Our process engages all stakeholders, including hourly personnel, facilitating acceptance of the final outcome and ensuring all reasonable concerns are addressed.

The services we offer are detailed in the Process section below.

THE METHOD:

Our Management of Organization Change (MOOC) process consists of three major parts: an Operator Performance Systems Assessment, a scenario-based Physical Assessment Tree Analysis, and a Procedure Review and Time Lining.

A team of the Client's personnel are required to perform a MOOC Assessment which is very similar to the team required for a HazOp analysis. Typically, the assessment is attended by one or two unit supervisors, the unit engineer, a process safety representative, one or more senior operators from the area, and a Union representative, where appropriate.

The process starts with the Operator Performance Systems Assessment. The Operator Performance Systems Assessment is an 11-part ladder assessment of 10 key management systems. These key management systems include: Situational awareness, team working, alertness and fatigue, training and development, roles and responsibilities, willingness to act, management of operating procedures, management of change, continuous improvement of safety, and management of safety. Each part benchmarks the site versus Best Practice and also includes a pass/fail line, providing a clear focus on strengths and areas of opportunity in Operator Performance Systems.

Next, we conduct the Physical Assessment Tree Analysis. Through the scenario-based Physical Assessment Tree Analysis we take each "worst case" scenario and subject it to seven logic trees. In this context, "worst case" refers to the most operator intensive response situations, which may not be the most catastrophic scenarios. Using these logic trees, we assess the capability of the operator to detect, diagnose and respond to an abnormal situation by examining: console staffing practices, additional work requirements during upsets and the availability of resources to aid in an upset.

To complete the process, we engage in the Procedure Review and Time Lining. Typically, 4-6 "worst case" scenarios are examined for each unit or area. Our goal is to determine the maximum level of effort required to safely detect, diagnose and respond to an upset. We then carefully review the response procedures for these scenarios and construct a time line indicating the levels of continuous effort and significant attention required by all operators involved. This yields a clear picture of the

manpower required to safely respond to a situation.

All three of these analyses are performed for the current staffing situation and then reviewed in context of the proposed staffing modifications.

The Process:

Introductory Workshops

We will come to your site and put on a two day workshop to review Management of Organization Change Best Practices with key personnel on your site. This is an excellent tool to create awareness within your organization, since many sites do not fully understand the potential impacts that changes in staffing levels, staffing arrangements and job duties can have on an Organization. Nor do they understand that current Best Practices, and in some regions regulations, require a formal Management of Organizational Change process.

Licenses

We offer single site, multi-site, and corporate-wide licenses that allow the Client to use the MOOC methodology to the best advantage of their organization.

Services

To best assist the Client in implementing the methodology within their particular organization, we customize the amount of time we spend on site. At a minimum, we will come on site for two days to train the Client's personnel to employ the MOOC Assessment Methodology. If desired, we can spend more time on site working with the Client's team to perform an actual Assessment with a real plant case. We can also spend additional time on site to act as facilitators to ensure the method is properly implemented. These services are quoted on a daily rate basis.

Manuals

We can provide detailed manuals documenting the MOOC Assessment process, including a detailed review of the pertinent guidelines and regulations. These manuals are an excellent resource to refresh those familiar with the method, or to train employees new to the process.

Benefits:

Our process ensures proposed changes are consistent with all current regulations and best practices. In addition, we have found that our process is an excellent way of engaging the hourly work force and ensuring legitimate issues are resolved before the change is implemented. Further, our process can uncover deficiencies in the current staffing scheme and prevent future upsets from escalating into costly incidents.

For example, we were asked to perform a MOOC assessment around proposed consolidations in a large oil refinery. During the assessment we were able to determine that the current staffing arrangement was not capable of responding to a realistic emergency situation in an adequate amount of time. The client was able to adjust staffing immediately to prevent future unit shutdowns and extensive catalyst damage should this event ever occur. In addition, we were able to make recommendations to enable the client to reduce the current five-man operating team to a four-man team in the future. Through this study, UCDS was instrumental in saving the client the cost of one duty station, ~\$500,000/yr., as well as avoiding possible expensive down time and catalyst replacement.

Related Services:

We strongly recommend that our Clients authorize a **Management System Gap Analysis** before we perform the Risk Assessment. This will ensure the Client receives the maximum benefit by ensuring UCDS has the greatest knowledge of the sites policies, practices, and procedures as we conduct the Risk Assessment.

User Centered Design Services is uniquely qualified to help clients identify potential operator rationalization and consolidation cases for both console and field operators by performing a **Console Staffing Assessment** and a **Field Operator Staffing Assessment**. We also can assist in helping determine the optimum make-up of the operations work team through a **Work Team Design Assessment**. Please see the Service Briefs for more information on any of the services.

SERVICE BRIEF:

Situational Awareness Workshop

The Situation:

Abnormal situations encompass a range of events outside the “normal” plant operating modes, e.g. trips, fires, explosions, toxic releases or just not reaching planned targets. The early work of the Abnormal Situation Management Consortium® included a survey of the US petrochemical industry. Based on their research the consortium estimates industry losses of around \$20 billion per year from abnormal situations, approximately equal to the total annual profits of that industry. A variety of evidence led to this estimate:

- Plant surveys show that incidents are frequent, with typical costs ranging from \$100,000 to well in excess of \$1 million per year. One plant surveyed had 240 shutdowns per year at a total cost of \$8 million. Many of these shutdowns were preventable.
- They found that refineries suffer, on average, a major incident once every three years costing on average \$80 million.
- One insurance company’s statistics shows that the industry is claiming, on average, over \$2.2 billion per year due to equipment damage. It is likely that actual total losses to the companies are significantly higher than what is claimable.

Further, these studies by the Abnormal Situation Management Consortium® indicate that companies achieving Best Practices in operations can improve productivity by 5-12%.

The Solution:

User Centered Design Services offers a full line of consulting services to evaluate your current plant condition, make realistic and achievable recommendations for improvement, and aid you in implementing our recommendations. As an introduction to the subject of Abnormal Situation Management and how we address the associated issues we have developed a two day workshop as described below.

Service Description:

Our two-day Situational Awareness Workshop provides an overview of the key elements that impact successful control room design. This workshop incorporates the findings from the research of the Abnormal Situation Management Consortium as it applies to operator situation awareness. The workshop will be tailored toward the decisions and challenges faced by the Client while approaching the new central control building project, and will be an excellent starting point for discussion within the organization. This will also facilitate the discussions that will occur during the Conceptual Design process.

The workshop covers the following topics:

- The International Ergonomic Standards for Control Rooms (ISO 11064)
- What is in an Operating Philosophy
- Common Control Room Issues including Distractions, Noise, Lighting, and Operator Vigilance
- Alarm Management and Human Computer Interface (HCI) design.
- How to design communications for a centralized control building
- Relationship between CCR and Field Shelter and the RP752 Recommended Practices for Occupancy (if appropriate)
- How to improve team work, communications and collaboration
- Console adjacency
- People – Primary & Secondary
- Functionality and room adjacency
- CRIOP – Crisis Intervention and Operability Analysis
- Documents involved in a Conceptual Design

Benefits:

This step helps educate the customer regarding options, successes and failures involved in addressing abnormal situations. This is a true front loaded activity and can produce significant project cost savings through the awareness of best and worst practices. This in turn can result in significant project savings.

Deliverable:

A two-day workshop at the client’s facility focused on the subject of abnormal situation management.

User Centered Design Services, Inc.

Biographical & Bibliographical Brief

Who We Are:

Our staff and affiliates are expert in every facet of control building design and operation. The UCDS Team includes process plant operators, supervisors, engineers, safety consultants, and human factors specialists. Our practical plant experience enables us to design a work environment that is effective in routine, abnormal, and emergency situations.

President

With more than thirty-five years experience in control and safety systems design, Ian Nimmo is the former Director of the Abnormal Situation Management Consortium® and a Senior Engineering Fellow for Honeywell IAC. The ASM consortium's members, who include the world's leading energy and chemical companies, are dedicated to improving process industry safety by discovering and publishing best practices in control technology deployment. Prior to beginning the work of founding the ASM consortium in 1991, Ian was a Development Engineer, a Project Engineer, Area Maintenance Engineer and lastly Computer Applications Section Manager for ICI, a large UK Petro-Chemical Company, and worked with the British Government's Health & Safety Executive introducing national & international standards for computer systems after developing the Control HazOp methodology for ICI. In great demand as a speaker, Ian is a faculty member of the Center for Process Plant Management. As a leading thinker in the field of control room operations, Ian was a contributing author of the ISA SP84 Safety Instrumented System Guidelines, ISA SP91.01 Standard, ISA SP18, IEC 61508 Standard, the EMMUA 191 Alarm Management Guidelines, and the Abnormal Situation Management Consortium's Best and Effective Operations Practice Guidelines. Currently Ian is a member of the ISA SP101 standard committee. Ian is an Instrument/Electrical Engineer with over 30 years working experience in the industry, and is a Senior Member of ISA and a Member of IET CEI.

Senior Consultants

With more than twenty years of experience, our Senior Consultant, David Lee, possesses extensive background in the chemical industry having worked for several specialty chemical, pulp and paper and petrochemical companies. A Chemical Engineer by degree David has held multiple positions in automation and control, IT, projects and operations, both as an engineer and a manager. David has extensive experience of multiple control platforms and associated applications, including batch, along with control room and operator interface design. David has significant experience in safety lifecycle development, LOPA and safety instrumented systems (SIS). David is a Chartered Engineer, Member of the Institute of Chemical Engineers, a Senior Member of the ISA and Member of the World Batch Forum. David is currently a working member of the ISA SP101 standard committee.

Our Senior Consultant Rusty Fleming has over 30 yrs experience in the chemical industry with a degree in Chemical Engineering. Rusty has held positions in the pulp chemical industry, water treatment chemicals industry, and the pulp and paper field. He has been a plant superintendant, process engineer and a company safety director. Rusty also has extensive experience in process hazards analysis studies and is a certified HazOp leader

Additional Resources:

User Centered Design Services has relationships with an extensive number of industry experts we can bring in on projects as needs require. This includes experts on training, procedures, human factors, graphics, instrumentation and control, project engineering, and many more. If a client identifies a need, we can find the right resources to put on the job.

Our Experience

The Abnormal Situation Management® (ASM) Consortium was founded in 1994 with a mission to conduct structured research to discover the Best Practices for improving an operator's ability to detect, diagnose and respond to abnormal process conditions. This included extensive research into the control building environment. UCDS delivers the fruits of this proprietary research, as well as Best Practices derived from visiting hundreds of control rooms around the globe and decades of practical operational experience, to our Clients.



With our substantial experience in the operations of production facilities UCDS is uniquely qualified to assess the workload of console and field operators, as well as assessing the entire operations organization against Best Practices and helping them achieve Operations Excellence.

UCDS are world leaders in ergonomic design of control buildings. Our focus when designing a control building is to base the design around the operator's needs and the work flow of the organization. This approach requires extensive experience in control room design as well as through understanding of refinery operations. This is in stark contrast to many others who have little or no operations experience, such as Architects and Engineering Contractors, who recycle control building designs as if one size fit all, and Equipment Vendors who design around their own equipment. Even other human factors consultants can fail to understand how the building will be used under all circumstances, including normal operation, start-up, shut downs, emergencies, training, and the list goes on.

Contact Information:

For more information, or to discuss how User Centered Design Services can help you achieve operations excellence in your facility, please contact us at:

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Please see the following sheets for a list of publications.

List of Publications by Topic

Alarm Management

- Rescue Your Plant from Alarm Overload, Ian Nimmo, Chemical Processing, January 2005
- Operator Consoles: Growing Old Together, Ian Nimmo, Hydrocarbon Engineering, January 2005
- It's Time to consider Human Factors in Alarm Management, Ian Nimmo, Chemical Engineering Progress, November 2002
- Designing an Ethylene Plant Control Room and Operator User Interface using Best Practices, Ian Nimmo & Jamie Errington, AIChE Annual Meeting Houston 2001
- The Importance of Alarm Management Improvement Project, Ian Nimmo, Interkamma 99 ISA Technical Conference Germany January 2000

Control Building Design

- PD-05-156 Operator Situation Awareness and the Impact on Control Room Design – Ian Nimmo – NPRA Meeting October 2005
- Operator Consoles: Growing Old Together, Ian Nimmo, Hydrocarbon Engineering, January 2005
- Designing Control Rooms for Humans, Ian Nimmo and John Moscatelli, Control, July 2004
- Putting a Human Face on the Design of Control Rooms. Ian Nimmo, Engineering Technology, May 2004
- Centralized Control Rooms the Good the Bad and the Ugly, Ian Nimmo, Honeywell User Group Australia 2003
- Designing a Control Building, Ian Nimmo, Hydrocarbon Engineering, November 2002
- Designing an Ethylene Plant Control Room and Operator User Interface using Best Practices, Ian Nimmo & Jamie Errington, AIChE Annual Meeting Houston 2001
- Ergonomic Design of Control Buildings, Ian Nimmo, Honeywell User Group Australia September 2000
- Ergonomic Design of Control Centers, Ian Nimmo, IBC Global Conferences London, England November 2000
- The Human Safety factor in Control Room Design and Location, Ian Nimmo, Interkamma 99 ISA Technical Conference Germany January 2000

Staffing and work team design

- Don't be Thrown for a Loop, Ian Nimmo & John Moscatelli, Chemical Processing, July 2005
- Operator Consoles: Growing Old Together, Ian Nimmo, Hydrocarbon Engineering, January 2005
- Shaping a New Role for the Operator, Ian Nimmo et al, Chemical Engineering Progress, May 2004

Abnormal Situation Management

- Human Machine Interfaces Evolve in Process Control, Ian Nimmo, Control, August 2006
- Effective Shift Handover is No Accident, Ian Nimmo, Chemical Processing, June 2006
- Lessons Learned From A Disaster, Ian Nimmo and John Moscatelli, Hydrocarbon Engineering March 2006
- PD-05-156 Operator Situation Awareness and the Impact on Control Room Design, Ian Nimmo, NPRA Meeting October 2005
- Operator Consoles: Growing Old Together, Ian Nimmo, Hydrocarbon Engineering, January 2005
- Abnormal Situation Management – The Need for Good Situation Awareness, Ian Nimmo, Advances in Process Control 7, York England September 2004
- ASM® A Practice or a Technology? Ian Nimmo, Aspen World Conference Key Note Address, Washington D.C. December 2002
- Mandated Human Error Controls in the USA, Ian Nimmo, Honeywell User Group September 2002
- Designing an Ethylene Plant Control Room and Operator User Interface using Best Practices, Ian Nimmo & Jamie Errington, AIChE Annual Meeting Houston 2001

- A Training Perspective on Abnormal Situation management establishing an Enhanced Learning Environment, Ian Nimmo & Peter Bullemer, AIChE Annual Meeting Houston 1998
- Developing an Improved training Strategy for Abnormal Situation Management, Ian Nimmo, Mary Kay O'Connor Process Safety Conference March 1998
- The ASM Story, Ian Nimmo, Hydrocarbon Engineering, December 1998
- Industrial Initiative Addresses 'Abnormal Events', Ian Nimmo, Hydrocarbon Processing, October 1998
- Managing Abnormal Situations in the Process Industries, Ian Nimmo, Ted Cochran & Peter Bullemer NIST Advanced Technology Program MVMT 1998
- The State of Abnormal Situation Management, Ian Nimmo, Honeywell User Group September 1996 Nice, France , Perth, Australia
- Abnormal Situation Management, Ian Nimmo et al, PACE- Process & Control Engineering September 1996 Vol.49 No.9
- Abnormal Situation Management, Ian Nimmo, 9th Symposium On Microprocessor Based Protection Systems, The BAFTA Center, London, Dec. 1995
- 21st Century Land Warrior technology for the 21st Century Refining Operator Abnormal Situation Management and the Digital Battlefield, Ian Nimmo & Scott Nelson, Mary Kay O'Connor Center and AIChE Mechanical reliability Conference November 1995
- The Concept of ASM and Mechanical Reliability, Doug Rothenburg & Ian Nimmo, AIChE Mechanical Reliability Conference November 1995 Houston, Texas
- Understanding Abnormal Situations, Ian Nimmo, NPRA Conference 1995
- Adequately Addressing Abnormal Situation Management, Ian Nimmo, Chemical Engineering Progress, September 1995
- Abnormal Situation Management: giving your control system ability to 'cope', Ian Nimmo, Honeywell Journal July 1995
- Abnormal Situation Management, Ian Nimmo, SafeComp '94 13th International Conference on Computer Safety, reliability & Security, Anaheim California 1994
- Abnormal Situation Management a Challenge, Ian Nimmo, ChemPID Feedforward Vol.30 Number 3 September 1994

Misc

- The Operator as IPL, Ian Nimmo, Hydrocarbon Engineering, September 2005
- Future of Supervisory Systems in Process Industries: Lessons for Discrete Manufacturing, Ian Nimmo et al, Institut Francais Du Petrole France Keynote: June 1998
- Future of Supervisory Systems in Process Industries Lessons from Discrete Manufacturing, Ian Nimmo & Ted Cochran NIST Advanced Technology Program MVMT 1998
- Are you Protected, Ian Nimmo & Alan Johnson, Plantline October 1997
- Process Control Failures in the Chemical Industry, Ian Nimmo, AIChE Loss Symposium Boston MA July 1995
- Extend HazOp to Computer Control Systems, Ian Nimmo, Chemical Engineering Progress, October 1994
- Management of Change Petro-Safe '94 5th Annual Environmental Safety & Health Conference for the Oil, Gas & Petrochemical Industries January 1994 George Brown Conference Center – Houston, Texas. ISA Best Safety Technical Paper 1994 – Winner Basil Balls Safety & Instrumentation Award.
- Start up Plants Safely, Ian Nimmo, CEP 1993. Also published in – Practical Engineering Perspectives Plant Safety by Gail F. Nalven, Editor AiChE
- OSHA 29 CFR 1910.119 Training, Ian Nimmo, Honeywell Designing Training Programs that Work Crescent Hotel Phoenix, AZ October 1992

- Making the Most of Instrumentation Modernization Projects, Ian Nimmo, Chemical Engineering Progress, June 1992
- Process Safety Management – A Suppliers Understanding of the OSHA 1910.119 requirements, Ian Nimmo, Hydrocarbon Engineering 1992
- Batch Control in the 90's, Ian Nimmo, Monterey University Mexico
- Lessons Learned from the Failure of a Computer System Controlling a Nylon Plant: Microprocessor Based Protection Systems pub Elsevier Applied Science ISBN 1 85166 611 7 Ian Nimmo
- Lessons Learned from the Failure of a Computer System Controlling a Nylon Plant: Achieving Safety & Reliability with Computer Systems SARSS '87 pub Elsevier Applied Science ISBN 1 85166 167 0 Ian Nimmo, Basil Eddereshaw & Stuart Nunns
- Intelligent Programmable Controllers: The answer to industrial Control Problems-European Study Conferences Limited – Effects of Microprocessors on Process Control and Plant Engineering 1th April 1980, The Selfridge Hotel, Orchard Street, London W.1 – Ian Nimmo



User Centered Design Services, Inc.

Corporate Brief

Our Vision:

User Centered Design Services, Inc. is a consulting company focused on *Operational Excellence*.

Our vision is to implement Best Practice solutions for reducing the frequency and severity of abnormal situations, which will dramatically improve the nature of operations in production facilities. These Best Practices impact all aspects of plant operation and will result in improved plant performance, a reduction in incidents, and improved safety and profitability.

The Situation:

Abnormal situations encompass a range of events outside the “normal” plant operating modes, e.g. trips, fires, explosions, toxic releases or just not reaching planned targets. The early work of the Abnormal Situation Management Consortium® included a survey of the US petrochemical industry. Based on their research the consortium estimates industry losses of around \$20 billion per year from abnormal situations, approximately equal to the total annual profits of that industry. A variety of evidence led to this estimate:

- Plant surveys show that incidents are frequent, with typical costs ranging from \$100,000 to well in excess of \$1 million per year. One plant surveyed had 240 shutdowns per year at a total cost of \$8 million. Many of these shutdowns were preventable.
- They found that refineries suffer, on average, a major incident once every three years costing on average \$80 million.
- One insurance company's statistics shows that the industry is claiming, on average, over \$2.2 billion per year due to equipment damage. It is likely that actual total losses to the companies are significantly higher than what is claimable.

Further, these studies by the Abnormal Situation Management Consortium® indicate that companies achieving Best Practices in operations can improve productivity by 5-12%.

What We Do:

User Centered Design Services offers a full line of consulting services to evaluate your current plant condition, make realistic and achievable recommendations for improvement, and aid you in implementing our recommendations. Our major service offering are:

Overview

- **Management System Gap Analysis** – We compare site management systems in detail to Best Practices and identify improvement opportunities. This is the same study that each ASMC member company has completed as part of their membership fee.

People

- **Console Operator Staffing Assessment** – We evaluate the number of console operators and workload for each, benchmarking each versus the site, industry and Best Practice. We then make recommendations for rationalization.
- **Field Operator Staffing Assessment** – We evaluate the number of field operators and workload for each, benchmarking them versus the site, industry and Best Practice. We then make recommendations for rationalization.
- **Work Team Design Assessment** – We assess the overall structure of the Operating Department and make recommendations for improvements.
- **Management of Organizational Change Services** – We educate and train the client on a methodology to implement staffing realignments and consolidation, while ensuring that safety and reliability are not compromised.

Workspace

- **Control Building Conceptual Design** – We conduct a high-level look at new or retrofit control building projects to ensure that all the site needs are considered and Best Practices are incorporated into the design. We develop an overall scope, vision and direction for the project.
- **Control Building Detailed Design** – Through a detailed look at specific issues for a new or retrofit control building projects we generate a document that will enable any Architect to design a control building which incorporates Best Practices.
- **Field Shelter Design** – Using a functional requirements approach we develop user centered designs for new and retrofit field shelters, along with a $\pm 30\%$ cost estimate.

Management Systems

- **Alarm Management Services** – We offer a complete line of services to improve the performance of your plant alarm system. Through a detailed assessment of your alarm management philosophy and alarm management practices we identify opportunities and methods to reduce standing and nuisance alarms, resulting in fewer operator errors. This, in turn, leads to reductions in near misses, incidents and accidents.
- **Human-Computer Interface Services** – We offer a complete line of services to improve the performance of your plants human-computer interface. In our detailed assessment of your control information philosophy and practices, we evaluate the number of screens necessary for operation and the quality of the information presented. Poorly designed graphics can increase the mental workload of operators by 10% and the time required to detect significant information by more than 25%.

Other

- **Engineering Services** – We offer these additional engineering services to meet our client's needs:
 - **Console Design** – Detailed design of operating and off-workstation consoles which incorporates the latest in ergonomics and operator alertness techniques.
 - **Feasibility Studies** – We can perform studies to assist the client in gathering information to present to Management to aid in justifying new projects.
 - **Automation Upgrade Consultation** – UCDS automation consultation will give you a vendor-neutral evaluation of your opportunities for improvement in control technology.
 - **Architect and Vendor selection** – We bring our extensive experience to aid in evaluating and selecting Architects, instrumentation and controls companies, I&E contractors, graphics implementers, advanced application software, operations and business support software, control consoles and furniture, overview screens, and plant communications equipment.
 - **Expert Witness** – We offer our expertise to assist you in addressing your legal issues. In 2000 we represented a major Refiner and helped the legal council understand Industrial Practices and the role of human error in a critical incident.
 - **Workshops** – UCDS can offer workshops in most of the subject areas we specialize in, including ASM Best Practices, Situational Awareness, Human-Computer Interface design, Alarm system management, and control building design. These workshops are an excellent way to introduce these concepts to your organization, educate stakeholders, and help form a vision for future plant improvement.
 - **Training** – We come to your site to provide detailed training to your personnel on any portion of the ASM Best Practices. Through our associate, TTS Performance Systems, we can provide best in class training at all levels of your organization.
 - **Job Task Analysis** – We use an analytical process to determine the specific behaviors required of humans in operator-machine systems. We determine the detailed performance required of people and equipment, as well as the effects of environmental conditions, malfunctions and other unexpected events on both. Within each task to be performed by people, we analyze the behavioral steps in terms of 1) information presented to, and received by, the workers; 2) their processing of that information (and previously stored information, goals, intentions, etc.) to interpret the system status and to decide what action, if any, to take; and 3) required worker inputs to the system (which includes other workers as well as the equipment).

"Ian Nimmo and User Center Design Services provided value insight to Calgon Carbon in developing practical options to implement a consolidated control room. Ian has the rare ability to quickly analyze the culture and needs of an organization from on site interviews. He accomplishes this thorough his command of the concepts and best practices for process control that allows him to establish immediate rapport with all levels of an organization. Ian's initial work built a basis to design and configure a system tailored to Plant operations. Ian has been a valuable resource to confirm and identify tools that support the situational awareness model. Periodic follow up discussions have provided need information on best available products ranging from shift change software to walkie talkie head sets."

Peter M. Yacoe, P.E.
Plant Manager
Calgon Carbon Corporation
Big Sandy Plant

"Ian has consulted for us in the area of alarm management, central control room design, and process control management and operator workload assessment. He is without doubt one of the world's experts in the above fields and has assisted us implementing leading edge techniques with definite business outcomes."

Angelo D'Agostino
Senior Process Control Engineer
Worsley Alumina Pty Ltd

Ian Nimmo was instrumental in helping us establish a company standard for operator graphics at Lyondell. We value his enormous expertise and excellent understanding of situational awareness and consult with him to support our efforts to establish an operational philosophy of operating by awareness.

Lothar A Lang, Ph.D.
Consulting Engineer
Control Systems and Electrical Engineering
lyondellbasell

"Ian's depth of knowledge and ability to persuade the end-user to think beyond their immediate technical requirements to consider people and business process requirements allowed us to design a really comprehensive Statement of Requirements. This both helped us win the implementation project and deliver a successful solution that has the best chance of delivering benefits for many years to come."

Chris Hotblack
Managing Consultant

Business Operations Consulting
Invensys Process Systems - Europe, Middle East & Africa

UCDS brought forth a new perspective and methodology that was not only useful but vital in the changes we are making in our operations group.

Michael Wright
VP Operations
Holly Refinery

Once I described him to the operator as the “Godfather” of Situation Awareness and Alarm Management. If you are working in Operations and don’t know who Ian Nimmo is, then you have every reason to believe that there are missing pieces in your production. “DON’T BE THROWN FOR A LOOP” once you meet him whether you are a console operator or manager in the refinery.

For once it feels good to know the truth about your process or organization even when it hurts. That is because Ian Nimmo provides clear message with guidelines and recommendation that are achievable if it’s on training or behavioral changes, or cultural changes of entire organization.

Situational Awareness and Human Machine Interface, Operator Staffing, Work Team Design, and Control Room Design are the services that Ian Nimmo provided to Hovensa, LLC in 2005. I wouldn’t have said for any company what I am about to say for UCDS. They are not promoting their products or services, instead best practices for your company.

Based on the complexity equation the impact of his study on console operator staffing at Hovensa was the product of console design for a new processing unit. Based on his recommendation a decision was made in which area would that operating unit would make the best marriage with the rest of refinery. The way Ian Nimmo designed the marriage was meant for the honeymoon to never end.

He can transform any abnormal situation into a normal situation using company concepts and his engineering talent. He will reach beyond proposing solutions that concentrate on process core values.

He has a rare content expertise in various areas, and ability to collect information and analyze hundreds of unique processes. Whether he is in the control room with operators on Friday evenings conducting interviews, or Sunday mornings in his Nomex out in the unit, or Monday morning in his suit in front of the management, Ian Nimmo makes it possible to bring people and ideas together to make continuous improvements. Think of his ideas as a money pit that you can reach by scooping your resources and transform them magically into Production Centered organization.

His publishing’s are another proof of his expertise in the field, and he spices it up with humor to cross the line and paint the visual of your current sad situation. He is the only company who will actually bring you down emotionally with the results of his studies, and bring you up by financially and more safely by leveraging your strengths.

Jasna Zekic

Staff Applications Engineer

Hovensa

Site Assessment at BP Grangemouth

Ian Nimmo was responsible for a critical operability readiness assessment for an operating unit within this plant in Scotland. I was the owner's internal corporate representative interfacing with Ian and his small team for this work. The goal of this assessment was to detail the plant's strengths and weaknesses in its ability to safely and productively operate the enterprise. No assessments were made of the financial or design aspects. The plant was a fully-operational, full-scale industrial chemicals manufacturing plant. The assessment was done during normal production operations. There were two significant visits: one for an assessment and a later one to follow up on the plant plans for incorporating the assessment results back into the plant operations.

The scope and design of the operability assessments were state-of-the-art. The concepts and strategy were developed in cooperation with the Abnormal Situation Management Consortium. The work of this consortium has become a standard benchmark for manufacturing site operability leadership in the world. Ian participated as the director of this program for several years.

Ian's site assessment was comprehensive, broad ranging, and impactful. It consisted of first-hand evaluations and observations as well as structured interviews with all levels of plant personnel. Elements assessed included operations, engineering, safety, maintenance, and overall work culture. A clear strength of the work was the normative assessments which were grounded in best practice comparisons.

I am not at liberty to discuss any of the specific results and evaluations that were conducted at site, unfortunately, due to the proprietary nature of this information, obviously. I am able to discuss the impact of this assessment. The assessment report to the site was attended by plant leadership; other leadership from other plants at this large industrial site; and corporate leadership. The clarity of the results clearly indicated that this assessment could provide important direction that the plant might take to render the operations much more safe, much more productive, and be a much better member of the community. Not that this plant was poorly managed – quite the contrary. This site was an innovation leader in the Company; which accounted for its receptivity to doing such a study in the first place.

Ian Nimmo played a key role in “selling” this assessment, in gaining the plant's cooperation, and in earning the plant's respect for the results.

Douglas Rothenberg, Ph.D.

Engineer Consultant
May 1, 2008

SERVICE BRIEF:

User Centered Work Team Design Assessment

The Situation:

The organizational structure of the Operating department can have a tremendous impact on the effectiveness and profitability of a production facility. The existing operations organization in many sites is the result of years of evolution, where incremental change has been implemented in response to changes in the plant or in business conditions. A company rarely goes out of its way to develop a specific culture, it happens because of events, experiences and policies, often leading to a situation where the owner has not consciously established a desired culture at the facility, yet is disappointed with the culture that has developed.

It is not unusual for this structure to be manipulated frequently by managers seeking to improve performance, but who have limited experience in what makes a truly effective organization. This can lead to operating personnel with inadequate training, little understanding of their roles in the organization, poor understanding of goals and objectives, and a high level frustration within the organization that results in sub-optimal overall performance.

The Solution:

User Centered Design Services has developed an assessment methodology that compares the current operations Work Team Design to industry Best Practice. Our review includes the Work Group Structure, the Work Group Interaction, and the Management Structure and Philosophy. Our process can be applied to current staffing at a site to indicate areas for improvement, as well as study potential staffing reductions to create a smaller team structure while retaining or enhancing overall performance.

METHOD:

Our analysis examines all aspects of the work team including the following:

- Work Group Structure
 - Size – Number of Field Operators, Console Operators, and Supervisors
 - Type and Level of Supervision
 - Proximity
 - Roles and Responsibilities
 - Continuous Learning Environment
- Work Group Interaction
 - Decision Making Style
 - Task Interdependence
 - Shared Goals and Objectives
 - Cooperation vs. Competition
- Management Structure and Philosophy
 - Informed Decision Making
 - Root Cause Analysis
 - Safety Stressed over Production
 - Environment of Continuous Learning
 - Cross Team Collaboration
 - Ownership of Goals and Targets
 - Compliance with Policies and Procedures
 - Clear Leadership Roles
 - Stated Values



- Clear Expectations
- Comprehensive Management of Change Policy
- Positive Reinforcement

The Process:

The typical process we use to perform a Work Team Design Assessment consists of a few preliminary conversations to determine the particulars of the study. We can apply this methodology to a single facility or all facilities throughout a Client's system.

The number of UCDS personnel and the duration of the visit will vary depending on the size of the facility and the scope of the study. Site visits typically range from one to two weeks and require two UCDS personnel. During the site visit UCDS will interview Senior Management, Operations Management, Operations Supervision, Engineering, and Operators. These interviews are typically an hour long. We prefer to interview Operators at their duty stations. This puts the operators more at ease, and minimizes scheduling issues and overtime costs for the Client. The Client should plan on a significant number of personnel being interviewed during the visit, and budget the internal cost appropriately.

After the site visit, UCDS will require a short period to analyze the data and generate a report. Our report will contain a full analysis of the Client's current practices and organization. We will compare these practices versus industry best practice and suggest modifications to improve overall performance. If desired, UCDS can return to the site to present our findings to Management.

Benefits:

The Work Team Design Assessment will help not just evolve a new organization and culture but also develop an organizational culture that will give the Client a competitive advantage and promote a positive safety culture. Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventative measures. In addition, a well designed organization can greatly improve overall job satisfaction and increase employee well-being.

Related Services:

User Centered Design Services also offers services to assist Clients who may be considering a realignment or consolidation of console or field operators. In addition, we can offer benchmarking services to compare overall site policies and procedures versus Best Practices. **Field Operator Staffing Assessment, Console Operator Staffing Assessment** and **Management System Gap Analysis** Briefs are available for additional information about these services.