

REVIEW OF OPERATIONAL INTEGRITY CONCERNS AT GREATER PRUDHOE BAY

October, 2001

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1.0 EXECUTIVE SUMMARY

BACKGROUND

In early 2001 some workers in the Greater Prudhoe Bay oil field (GPB) chose to go outside the company to voice concern about the integrity of GPB facilities and operations. BPXA management commissioned this study to investigate whether the concerns raised were valid and determine if the process for resolving employee concerns within GPB was effective. An Operations Review Team (Team), independent of GPB management, was formed at the request of senior BP management in response to these issues. The Team included BP staff and external technical experts and other consultants together with GPB line personnel.

This report is a product of the Team and does not necessarily reflect the view of BPXA management or the GPB owners. Field management was not represented on the Team, but will be provided the opportunity to review and respond to Team findings and recommendations. These responses will be attached to this report as Appendix A.

TEAM'S CHARGE

The Team was asked to:

- Determine the effectiveness of the processes in place for communicating, prioritizing and resolving employee concerns.
- Review staffing levels to ascertain whether there are enough people for handling operations during normal and upset conditions.
- Confirm the maintenance process ensures that safety-critical work is done and meets compliance requirements.
- Review the current fire and gas detection and suppression systems to confirm they are safe and the plans to deal with obsolescence are adequate.
- Examine the process for shutting down production to assure that this can be done safely during both normal and upset conditions.
- Review new facility designs to ensure they are safe and operable.

The Team also addressed other areas of concern identified during worker interviews.

REVIEW AND FOLLOW-UP PROCESS

Over a seven-week period in July and August 2001, the Team interviewed approximately 250 (of 600) BPXA field personnel and 50 contract and support service personnel drawn from both the western (WOA) and eastern (EOA) operating areas of the field. The Team believes the report is representative of BPXA employee opinion,

But may not fully represent the concerns of contract workers due to the limited number of these individuals who were interviewed.

The findings included in this report are based on concerns expressed by the workforce during these interviews. The Team validated many significant issues through direct observation, discussion with knowledgeable personnel and/or review of available data.

In developing its recommendations for dealing with the issues raised by the workforce, the Team took into account the suggestions made by the workforce for resolution of those concerns.

Recommendations of the Team accepted by GPB Owners become the responsibility of GPB management to acknowledge and implement in a timely manner.

Senior BP management should consider whether it is desirable for the Team to have an ongoing role to review progress in implementing the recommendations accepted by the GPB Owners.

CONCLUSIONS

The majority of workers (“workers” in this report refers to BPXA and contractor employees) feel safe working at Prudhoe Bay. Employees are confident of their own ability, and the ability of their co-workers, to recognize workplace hazards. They take great pride in their work, their abilities, and in what has been achieved over the years in the field. They feel that the mechanical integrity of the equipment, while generally acceptable, is deteriorating as the field ages. Workers consider that certain critical safety systems are in need of urgent maintenance or significant upgrades.

All BPXA employees interviewed stated they would be prepared to raise significant safety and operational integrity concerns. Although the Team did receive information that harassment and intimidation had, on occasion, occurred, they did not find pervasive harassment, intimidation or retaliation of BPXA employees.

The workers are not convinced that management is adequately addressing their operational integrity concerns. Management has not effectively communicated how workers’ concerns have been included in decision making processes hence trust in management has eroded. A fundamental lack of trust of all levels of management above the Operations Team Leader (OTL) level exists among many of the GPB operators and technicians. Although these feelings are stronger in the WOA than the EOA, the issues are similar in both areas. Workers believe this trust can be rebuilt if open and honest communication between workers and management can be developed.

The Team believes that much of the poor communication and mistrust described in this report stems from a long progression of decisions, actions and inactions over the last five to ten years. Some employees questioned whether this report would have an impact, believing that GPB management will ignore the findings and recommendations of the Team. On the other hand, many workers felt conducting this study using independent, outside, and line personnel was a positive move by BP management.

Current field management is new; key members have been in their positions for less than one year. To their credit, field management had recognized many of the communication and trust issues before this Team was formed. While there is evidence that they are actively working to correct some of these issues, the actions that have been taken are not deemed sufficient to correct the overall situation. The Team did receive positive comments from workers concerning these efforts by the current field management team.

The Team believes that the principle underlying causes of employee concern include:

- Reductions in staffing, training and budget which many workers believe are making field operations less safe. Associated reorganizations have resulted in unacceptably large spans of control and responsibility for supervisors and workers in some areas.
- The pace, timing, and degree of budget reductions and the way in which these have been communicated and implemented over the past decade.
- The slow pace of work to integrate BPXA and ARCO-heritage management systems, making activity-based decisions difficult.
- Management decisions being made on the basis of incomplete data because current management systems do not accurately capture or track activities and costs and coordinate them on a field wide basis. Where systems are in place they are not used effectively.
- An organization that does not clearly assign accountability for delivery of operational excellence or operational integrity (which includes maintenance and mechanical integrity).
- Inconsistent leadership, manifested by changes in management direction, and exacerbated by frequent management turnover and lack of a fully developed GPB business strategy that reflects current direction.

Correcting these underlying causes is essential for rebuilding workers' confidence in management and for ensuring long-term operational efficiency and mechanical integrity of the GPB operation. Without a concerted effort to address these basic issues, any other actions will provide only temporary relief.

Summary of Actions Recommended

The following are recommendations for fundamental changes in management philosophy that require action. Specific findings and recommendations associated with these actions are given in Section 3 of this report.

- Define and implement changes to the GPB management structure which will create a more functionally efficient and effective organization and position GPB to attain BP's goal of being a "Great Operator."
- Work with employees to develop both short and long term solutions to their staffing level concerns.
- Carefully select, train and retain workers involved in the performance of safety-critical maintenance activities to ensure that they are competent and appropriately licensed. This would result in adequate staffing for completion of mandatory inspections and preventative maintenance and hence improve the quality and productivity of teams working with complex systems. This could be achieved by in-sourcing maintenance personnel who perform safety-critical work.
- Improve communication and rebuild trust between management and employees. This will require a sustained change in management behavior that demonstrates commitment to building a relationship based on trust and mutual respect.

The Team recommends immediate actions be taken on the following items which have been raised as specific immediate concerns by workers:

- Identify and address all potential non-compliance issues immediately.
- Continue actions already initiated to bring pressure safety valve and fire and gas panel inspections up to date.
- Continue progress towards upgrading fire and gas detection systems on a field wide basis. Continue to identify and address all fire and gas detection issues that have a potential immediate safety impact or that pose an environmental threat.
- Implement a significant increase in the scope of the external corrosion monitoring and repair program by 2002.
- Initiate a field wide program to clean and grease isolation valves, followed by a survey of the isolation valves to determine the extent of internal leak-through

together with an assessment of the degree to which leak-through impacts the ability of field operators to safely shut down production. A preventative maintenance routine should be developed to maintain isolation valves, taking into account manufacturer's recommendations.

SUMMARY OF PRINCIPAL FINDINGS

Communication & Leadership

- Most employees are not afraid to share concerns and discuss difficult issues with their supervisors.
- Employees have previously raised issues and concerns to management. Many of the issues and concerns discussed later in this report are not new and have been the subject of significant study and discussion.
- Employees believe field management has done a poor job of listening, acknowledging and responding to their concerns. Employees have, on occasion, sought agency review of management decisions with which they disagree.
- The process for resolving worker concerns is not working effectively. Some workers have chosen to raise concerns outside the company.
- Mistrust of GPB management above the OTL level has compromised management's ability to effectively communicate with workers.
- Workers accept that safety is a company priority. However, many of them believe, based on decisions taken at GPB, that achieving budget targets is actually GPB management's first priority.

Maintenance

- Maintenance backlogs are large and growing in some areas. At the time of the Team's review, preventative maintenance backlogs for Pressure Safety Valves (PSV's) and for fire and gas detection system panels were unacceptable for both EOA and WOA. Resources and processes are being put in place to assist in eliminating these backlogs.
- The current definition of "safety-critical" differs in EOA and WOA, is too broad and results in unrealistic classification of some systems and devices. A consistent and better-focused definition is required which will enhance management's ability to appropriately schedule work taking due account of its true safety priority.
- Efforts to implement a Reliability Centered Maintenance (RCM) program have been slowed by changes in program approach, budget constraints, the need to understand and integrate ARCO-heritage maintenance programs into the field-wide model and by the lack of a single comprehensive maintenance

management system in which all information needed to ensure mechanical integrity and regulatory compliance is available to managers, maintenance planners and technicians.

- Mechanical breakdowns that impact production or the environment result in immediate action, but workers feel that long-term integrity concerns are often not addressed.
- Spare parts inventories are inadequate and poorly managed, causing delays in maintenance activities.
- The internal CO₂ corrosion control program at GPB has evolved over the years and is “best in class” within the BP system. The BPXA Corrosion, Inspection and Chemicals Team have made a proposal for a major expansion of the external corrosion inspection program. The Team strongly supports a significant expansion of the external corrosion inspection program.

Fire and Gas

- The original fire and gas detection systems still function as designed. However, the systems are old, portions of them pre-date current code and replacement parts are difficult to obtain. Maintaining these systems is becoming increasingly time-consuming and difficult. The technicians responsible for maintaining these systems are very concerned about continuing degradation of system reliability, and the ability of these systems to protect the work force. Parts salvaged as facilities are upgraded could speed repairs and ease maintenance of remaining legacy systems.
- Significant progress has been made towards development of a state-of-the-art fire and gas detection system to replace that in use since field start-up. System requirements have been defined for every facility in the WOA and a pilot system has been installed, tested and evaluated. GPB has sought approval of the new system by state regulators and listing organizations prior to undertaking field wide upgrades. The Team strongly recommends upgrading the fire and gas systems.
- Preventative maintenance, including scheduled maintenance required by regulation, has not been completed as scheduled for all fire and gas system equipment. Management has taken short-term steps to eliminate this backlog by providing additional staff and is considering a long-term plan for preventing recurrences.
- An expedited review of the EOA fire and gas system should be completed and a plan developed that addresses the current staff responsibility and is designed to improve system reliability.

Production Shutdowns

- At the present time production can be shut down safely but may require closure of manual valves by operators.
- Many workers believe their ability to safely shutdown production has been diminished by staff reductions (see Section 3.6, Staffing) and the deterioration of the valves used to isolate production.
- Workers believe internal leak-through of isolation valves (shutdown valves, divert valves, flare valves and perimeter valves) is a significant problem and under certain circumstances may pose a potential hazard to workers and equipment. Operators point to continued flaring after an emergency shutdown, and difficulty in achieving process isolation as evidence that appreciable internal leak-through is occurring in some automatic isolation valves.
- A formal assessment of internal leak-through in isolation valves has not been performed, so the extent of this problem is not known. A team should be assembled to assess internal leak-through in key isolation valves and develop an appropriate action plan.

New Facility Design / Open-Air Skids

- Open-air skids are less expensive to build than enclosed skids and greatly reduce the risk of explosion from all but large gas leaks.
- Many GPB field personnel do not view the more complex open-air skids favorably and expressed a preference that all skids be enclosed.
- Operation and maintenance of open-air skids are more difficult during much of the year, because workers and equipment are exposed to Arctic conditions.
- New skid designs appear to accept higher maintenance costs in order to save initial costs. In addition, field workers feel their input is not incorporated in the design of open-air skids. Many believe open-air skid designs are driven by capital cost considerations alone.
- Open-air skids with lined secondary containment installed beneath them will not contain spills, especially wind blown sprays, with the same effectiveness as do enclosed skids. Leak detection at open-air skids depends on direct observation by workers.

- Facility designers appear to have taken a renewed interest in feedback from workers concerning open-air skids. This is seen as an encouraging development, but follow-through will be important to rebuild trust.
- Some actions are being taken to address employee concerns in the retrofitting of existing open-air skids and the design of new skids, but not at the pace expected by workers.

Staffing

- Workers believe management has ignored their suggestions when setting staffing levels.
- **Operations staffing-** Within the Production Operations Department, current staffing is adequate to handle operations under normal operating conditions. However, workers feel that operations staffing is not sufficient in some areas of the field to allow for normal operations together with training requirements, increases in maintenance work activity, vacations and other absences, or to prevent escalation of process upsets.
- Although plant operators are directed to shut down wells, equipment or facilities if they doubt their ability to maintain control by any other means, many workers feel that staffing levels are too low to prevent escalation of process upsets.
- **Emergency response staffing –** Workers report that Emergency Response and Spill Response Teams have a difficult time maintaining a full complement of trained responders. Workers are concerned that this could impact the ability of these teams to effectively respond to emergencies.
- Workers are also concerned that staffing on some shifts in some facilities is not sufficient to allow rescue action by facility personnel. In the WOA, the emergency response (ER) policy is to wait until the ER team arrives to assist with ‘man down’ situations; response time at the more distant facilities, depending on weather, can be more than thirty minutes. In the EOA, operators have been trained as responders, but staffing in some areas would inhibit proper response.
- **Maintenance staffing-** Additional workers are necessary in the near term to reduce maintenance backlogs, achieve regulatory compliance in safety-critical areas and accomplish essential preventative maintenance on schedule. Management has begun this process, bringing on additional personnel to inspect fire panels and certify Pressure Safety Values (PSVs). Long term staffing levels should be established to effectively implement the overall maintenance strategy and should be based upon a comprehensive view of planned activities.

- The Team believes the productivity and effectiveness of maintenance personnel can be greatly increased by improving maintenance planning, using a reliability centered maintenance (RCM) approach, enhancing the availability of parts and streamlining administrative tasks.

Budget

- GPB Owners have attempted to hold “per barrel” lifting cost constant as production rates declined in an effort to keep GPB competitive with their other fields for continued investment. This has resulted in significant pressure on operating and maintenance budgets over the past decade.
- Many employees believe that budgets have been cut too deeply and that GPB management’s top priority is controlling costs in order to achieve short-term budget targets and not safety, regulator compliance or delivering long-term operational integrity.
- Budget decision makers are not as well informed as they should be because the tools available to management do not accurately track activity levels and costs on a field wide basis.

2.0 Operations Review Team Personnel

The team included technical experts from inside and outside BP, independent consultants and workers (operators and maintenance technicians) from the Greater Prudhoe Bay Business Unit.

“Oz” Arundell

Mr. Arundell is a Lead operator at Flow Station #1 located in the EOA. He has 21 years of industry experience; three years at Union Chemical and 18 years at Prudhoe Bay. He is a past member of the Spill Response Team, wrote many Process Safety Management operating procedures, and is a Safety in Motion instructor. Oz holds a B.A. degree in History and a secondary teaching credential.

Paul Flaherty

Mr. Flaherty is a Principal with ENVIRON Corporation in Massachusetts and directs ENVIRON's New England-based operations. Prior to joining ENVIRON he managed the environmental & Process Safety Technology Group at Arthur D. Little, Inc. Paul's primary areas of expertise include technical management of pollution control studies and risk-based control strategy / technology studies and the implementation of optimum control strategies. Paul holds a B.S. degree in Atmospheric Science and Agronomy and an MBA.

Billie Pirner Garde

Ms. Garde is a Partner in the Washington, D.C. law firm of Clifford, Lyons and Garde. During her career she has often represented concerned workers who suffered reprisals for voicing safety or environmental concerns. In addition to her law practice, Billie advises Alyeska, BP and other companies on how to effectively address employee concerns.

Mark Humphrey

Mr. Humphrey is a Lead Operator at Gathering Center #2 located in the WOA. He has 21 years experience in the Western Operating Area facilities and helped organize the original PSM compliance effort for the WOA facilities. Mark is a 15-year member of the WOA fire team and an ERT Advisory Team member. He is also active as a People Advisor Team member and participated in the People Team 2. Mark is a member of P.A.C.E. local 8-369 at Prudhoe Bay.

Mitch Jensen

Mr. Jensen is a Production Operator at Flow Station #2 located in the EOA. Mitch has 15 years of experience at Prudhoe Bay, 10 years in maintenance and five years in operations. He has also worked as a relief operator at the Drill Sites and Pad-3. Mitch is a Captain with the Fire Team, a past member of the Spill Response Team, and Participated as a member of the Best Practices review team.

John Johnson

Mr. Johnson is a BP employee working with the Upstream Technology Group and is currently based in Houston, Texas. He has an extensive background in integrity, maintenance, inspection reliability systems in both upstream and downstream facilities. John has held positions with the American Petroleum Institute (API) in the Inspection Sub-Committee and the Technical Management / Oversight Committee and has authored 12 technical articles in the Corrosion/Materials field. John Holds a B.S. degree in Metallurgical Engineering and a M.S. degree in Materials Science.

Marc Kovac

Mr. Kovac works in the west-side Field Crew at Prudhoe Bay. He has 23 years of experience with BP, 18 years as a welder and 5 years as a mechanic. Marc is a member of the Spill Response Team and a past member of the Fire Team. He is Vice-Chairman of P.A.C.E. local 8-369 and serves on their negotiating committee.

Mark Murphy

Mr. Murphy has 24 years of experience in the oil and gas industry. Mark worked for the Shell Oil Company in California and Alaska for 12 years as an instrument technician. He has worked for BPXA for 12 years, continuing as an instrument technician. Mark is the Unit Chairman for P.A.C.E. local 8-369 at Prudhoe Bay.

Dave Norton

Mr. Norton served as a Commissioner on the Alaska Oil and Gas Conservation Commission (AOGCC) and is a technical management consultant for the oil industry in Alaska. Prior to joining the AOGCC, Dave worked as an engineering manager/supervisor for Alyeska Pipeline Service Company for over 22 years. He has extensive experience in project engineering and project management, including mainline valve replacement and repair for the Trans-Alaskan pipeline. Dave holds a B.S. degree in Civil Engineering and is a registered professional engineer in Alaska and Texas.

Joe Pantermuehl

Mr. Pantermuehl has worked at Southwest Research Institute (SWRI) in San Antonio, TX since 1968. He has extensive experience in mechanical design, instrumentation and problem solving in the oil and gas industry. Joe has written and co-authored numerous technical reports and articles, and he holds a number of patents. He has conducted field studies at plant facilities, including offshore platforms, around the world for international oil companies. Joe holds B.S. and M.A. degrees in Physics from Southwest Texas University.

Arthur Penny

Mr. Penny of Pilko and Associates, Inc. of Houston, Texas has over 35 years of oil industry experience including upstream and downstream operations in world-wide operations including Europe, Former Soviet Union, North America, South America, Africa (Nigeria), Indonesia and China. His experience includes numerous environmental, health and safety due-diligence inspections of major oil fields in Argentina, Nigeria,

Indonesia and the United States. Maintenance and operational practices were an integral part of such inspections.

Kevin Spyker

Mr. Spyker is an Audit Relationship Manager and Lead Auditor with BP Internal Audit based in Anchorage. He has 24 years of experience with BP; 15 years in refining and production operations as an operator and supervisor, and seven years in training, PSM, and Operations Integrity assignments. Kevin spent 13 years at Prudhoe Bay and is familiar with the North Slope operating environment. He holds a B.A. degree in Organizational Management and an MBA.

Pete Stickles

Mr. Stickles is a chemical engineer with Arthur D. Little Inc. During his 36-year career he has participated in or led numerous projects for Arthur D. Little, Inc. involving hazard and risk assessment of petroleum upstream and downstream operations. Pete has extensive experience in failure analysis and quantitative risk assessment applied to a variety of facilities and is a senior hazard and operability (HAZOP) study facilitator.

3.0 Specific Focus Areas

3.1 Communication and Leadership

Primary question

How effective is the process for communicating and resolving safety and environmental issues?

Answer:

The Team found that processes exist across GPB, which enable employees to communicate their issues and concerns to their supervisors and managers. These processes have been utilized by employees, but have not been effective in bringing about resolution of many of the significant issues of concern to some employees.

Overview:

The Team found substantial evidence that WOA workers have, within the past five to seven years, communicated concerns, suggestions, issues and opinions to GPB management by both formal and informal means. During this time, management made significant efforts to encourage and facilitate employee communications on many issues (including safety). This encouragement created an expectation that management would consider workers' opinions and respond to the issues with decisions or information. When employees did not feel management was responding they became frustrated. Some employees viewed management's statements of interest in employee concerns as being disingenuous. Many factors contributed to this situation over the years, including numerous management changes and issues stemming from the unionization of WOA operators and maintenance technicians. Regardless of the cause, there is a perception held by many employees that management has not been respectful/responsive to the concerns of operators and technicians.

Findings

3.1.1

All employees interviewed stated they would be prepared to raise system integrity or safety issues for resolution and are confident in their own ability to recognize work place hazards.

3.1.2

There were some reported complaints of harassment, intimidation and retaliation, but the incidents are isolated and have not had a pervasive impact on the willingness of employees to raise safety concerns.

3.1.3

Employees believe field management has done a poor job of listening to, acknowledging and responding to their concerns about safety operation of the

Field. The perception is that little or no consideration has been given to issues identified by employees and that operators have received little feedback on the way in which their concerns were considered and addressed in management decisions (e.g. skid 19 egress issue was not addressed in a timely manner).

- 3.1.4 Employees perceive the HSE Committees to be an important venue for raising safety and environmental concerns. However, there have been no effective processes within either the WOA or the EOA HSE Committees for bringing contentious issues to closure. (The two Committees have recently been combined.)
- 3.1.5 Many of the employee concerns discussed in this report are not new and have been the subject of significant study and discussion for a considerable period.
- 3.1.6 Many workers believe too many directives come from Anchorage and that the people issuing the directives have inadequate knowledge of operations at GPB.
- 3.1.7 Turnover of managers has been too rapid. The tenure of key managers has been too short to develop, implement and assess the impact of management initiatives. Accountability for routine management responsibilities is not always clearly defined. Assigned actions are not always time-specific and follow-through is lacking. Workers perceive that programs initiated in previous years are often abandoned when the manager is transferred.
- 3.1.8 Workers have little trust in GPB management above the OTL level. Many employees view any new programs primarily as a tool for reducing spending and staff levels. Management credibility has been compromised by lack of feedback, perceptions of deteriorating mechanical conditions in the field and high rates of management turnover. Commitments made by one management team are not always kept by the following team. The result is a work environment in which management's promises and initiatives are heavily discounted by workers.
- 3.1.9 The level of worker mistrust of management in the WOA is more acute and personal than that at EOA, largely due to a longer history with the company and BP management, in addition to issues associated with the emergence of the union in 1995. The EOA workers do not have this historical distrust, but voiced growing skepticism about the quality of management communications and concern about the impact of further cutbacks.
- 3.1.10 The majority of operator level employees believe a positive, trust-based relationship can be built with management, but that it will require time and demonstration of greater commitment than they have experienced in the past. Many WOA employees expressed the sentiment that this is management's last full opportunity to recapture their trust.

- 3.1.11 Workers are told safety is a BP priority, but there is a disconnect between GPB management's stated commitment to safety and the perception of that commitment at the operator level. Many workers believe, based on actions taken, that achieving short-term budget targets is GPB management's first priority.
- 3.1.12 There is significant confusion at the operator and technician level about GPB management's long-term vision and business strategy for GPB. Company goals are largely unknown and, where stated, are perceived as inconsistent with most actions. Both field management and employees recognize that profitability is critical to the continued viability of the field and that there are market factors outside management's control. They accept that this reality sometimes calls for difficult decisions relative to budget and resources.
- 3.1.13 Communications and feedback from management to employees is inadequate. Senior management relies too heavily on one-way communication methods (e.g. posters, town hall meetings and e-mail). There is not enough two-way communication in small group settings.
- 3.1.14 Field management has failed to effectively communicate plans, timelines and actions related to the integration of the WOA and EOA to first line supervision and the workers. This has contributed to stress in the organization.
- 3.1.15 The first line OTLs have too many responsibilities and obligations to be effective in managing employees and addressing employee concerns. OTLs typically supervise 35-75 employees and multiple facilities. Due to other constraints and demands, OTLs are not able to spend sufficient time interacting with their direct reports. Nevertheless, in almost every case, there is wide respect among operators for most of the OTLs and an appreciation of the enormous responsibilities carried by the OTLs.
- 3.1.16 The current HSE organizational structure is fragmented.
- 3.1.17 Field personnel do not always make effective use of safety advisors in planning and executing tasks.

Recommendations

- 3.1.18 To start to build trust between workers and management, employees' concerns must be addressed and appropriate feedback given (orally or in writing as necessary). Senior GPB management must recognize the existing degree of mistrust, acknowledge some responsibility for the situation, and make a fundamental change in the manner in which it makes and communicates management decisions to its workforce.

- 3.1.19 GPB management should define, implement or improve processes and tracking systems that will result in thoughtful and responsive feedback to workers on concerns and business decisions. The process should clearly assign accountability for managing employee issues and giving timely response to any employees who raise concerns.
- 3.1.20 GPB management should communicate a clear vision and strategy that is sound in principle, clear in meaning, achievable, connected to production issues in the field and provides a focus for the long-term (five years or more).
- 3.1.21 Review and revise as necessary the WOA and EOA integration plan. Develop a new schedule based on pace of achievement to date and future targets. The plan should consider a wide range of strategic issues (e.g. field geography, operating and maintenance practices, the long term business plan, communication systems, employment practices.)
- 3.1.22 The GPB business strategy and any short-term modifications made in response to business conditions should be clearly communicated to all workers at GPB. The vision and strategy should be used as the basis for an implementation plan that engages first and second line management so that they in turn can effectively engage the workforce.
- 3.1.23 Management assignments at GPB should be lengthened. Managers should remain in their positions for three to five years in order to develop consistency and reestablish trust. Management performance reviews should be based on a rolling three-year period.
- 3.1.24 Employees at all levels must be assigned clear responsibilities and made accountable for their actions or inactions.
- 3.1.25 BPXA policies on harassment, intimidation and retaliation should be clearly communicated to all GPB employees and contractors in a way that makes clear both requirements for acceptable behavior and consequences for violations of the policies.
- 3.1.26 Managers and Team Leaders should receive initial and periodic training on BPXA's policies prohibiting harassment, intimidation and retaliation. This training should include how to avoid behaviors and actions that could be perceived as threatening, intimidating or retaliatory by workers.
- 3.1.27 Alternative means of access to management should be developed, including a confidential and anonymous process, to provide employees additional opportunities to report issues and concerns.

- 3.1.28 BPXA management should consider how to increase honest and objective feedback between individual employees and their supervisors regarding performance and development and opportunities while avoiding the failures associated with similar processes in the past.
- 3.1.29 The Team recommends that roles, responsibilities and the span of control for the OTL position be re-evaluated. In addition, the Team recommends additional training for new supervisors in the areas of management, supervision, communications, and similar leadership attributes.
- 3.1.30 Management communication tools should be reviewed with the objective of making them more relevant. Management should reduce their dependence on e-mail for communicating with workers and should instead make greater use of small group meetings to facilitate more two-way communication. The workplace policies made available to employees via the intranet should be reviewed for completeness and accuracy and updated regularly.
- 3.1.31 Management changes should occur with reasonable hand-over periods and follow existing Management of Change (MOC) procedures to ensure a successful transition and maintain consistency of communication to employees.
- 3.1.32 The HSE organization at GBP was undergoing reorganization as this report was being prepared. The new organization should be better aligned with principles the Team feels are important. Those principles are:
- Each operational unit is primarily responsible for HSE issues
 - Field-based HSE groups provide services to the operational units
 - Industrial hygiene should be part of the HSE group
 - Expert support to the operating units in areas such as permitting should be available through BPXA's central HSE organization.
- 3.1.33 This review did include interviews with some contractors but the main focus of interviews has been BPXA employees. Additional assessment of the contract work force communication should be made in order to ensure that BPXA and GPB contractors are effectively encouraging contractor employees to express their concerns.

3.2 Maintenance

Primary Question

Does the GPB maintenance process ensure that safety-critical work is done and meets compliance requirements?

Answer

Some safety-critical work and work required by regulations is not being done in a timely manner. Resources and processes are being put in place to assist in accomplishing safety-critical work on schedule while meeting compliance requirements. The current definitions of "Safety-critical" differ between the EOA and WOA and are too broad. A consistent and better-focused definition of "safety-critical" will enhance management's ability to ensure work is appropriately scheduled to account for its safety priority.

Overview

During the review, the Team formed the impression that the vast majority of maintenance workers, on the front line and in management, are experienced in their areas of responsibility and are dedicated to maintaining the facilities for which they are responsible at the highest levels possible given field budget constraints.

There are good programs/concepts in place, such as the Packages of Defined Scope maintenance process and the Materials Optimization Process. The Overhaul Tem works across the WOA and EOA and is well integrated across the field. Over fifty percent of their work is planned using trend data as basic input for setting priorities. Appropriate extension of intervals between inspections is allowed by sound engineering judgment and experience. The Corrosion, Inspection and Chemicals (CIC) Team has taken steps to control internal CO₂ corrosion and reduce leaks while reducing expenditure for corrosion inhibitors. The Quick Response Team (a group of four to six people selected by the Ops Support Manager to address urgent situations as they arise) has provided input to management on those maintenance items needing priority action.

Despite the commitment of workers and OTLs, maintenance backlogs are large and growing. Examples of unacceptable backlogs include fire and gas panel inspections in the WOA and Pressure Safety Valve inspections across the field. Resources have recently been committed in these areas with the goal of eliminating the backlogs by year-end.

Efforts to implement an RCM program have been slowed by changes in program approach, budget constraints, and the need to understand and integrate ARCO-

heritage maintenance programs into the field-wide model. There is a lack of a single comprehensive maintenance management system in which all information needed to ensure mechanical integrity and regulatory compliance is available to managers, maintenance planners and technicians.

Accurate reporting is essential for implementation of an effective reliability program and for establishment of maintenance budgets that allow effective utilization of maintenance staff and resources.

Findings

- 3.2.1 Maintenance backlogs are large and growing in some areas. Contributing factors include the installation of new equipment, aging infrastructure and reductions in staff.
- 3.2.2 There is a GPB Maintenance Management Strategy that is patterned on BP's common maintenance strategy. However, it has not had wide exposure outside the Operations Support area, and accountability for its delivery has not been fully accepted by Operations. Hence, implementation of this strategy has been slow.
- 3.2.3 The current organizational structure contributes to "maintenance work not getting done." Currently, there are a significant number of maintenance organizations at GPB (e.g. Operations Support, Gathering Center/Flow Station Maintenance, Field Maintenance, etc.). Several of these organizations provide maintenance from a central location; others are decentralized. It is not clear that leadership in all facilities responsible for maintenance is managing maintenance effectively. Some workers are unaware of regulatory compliance issues for their particular areas.
- 3.2.4 Maintenance procedures are lacking in some areas. Maintenance procedures differ in form and content between the EOA and WOA. Some technicians reported difficulty in obtaining written procedures for some tasks.
- 3.2.5 The mechanical integrity management system is fragmented; although there is a plan being developed, there is currently no single comprehensive mechanical integrity program that defines and coordinates maintenance activities and required documentation. The current situation perpetuates misclassification of safety-critical equipment in the master equipment list and contributes to late completion of preventative maintenance activities.
- 3.2.6 A RCM solution has been adopted but the program has stalled due to changes in program direction, resource limitations and because the RCM team has been diverted to other activities. Broad understanding and acceptance of the RCM concept is low because progress has been slow and poorly communicated.

- 3.2.7 The effectiveness of the maintenance program at GPB could be improved through better communication and coordination between the Operations and Operations Support teams. Responsibility for many routine maintenance tasks resides at the facility level while the Operations Support Group is responsible for planning and executing major repairs. Criteria used in making routine maintenance decisions vary from facility to facility. There is little coordination between maintenance planners and facility-based maintenance personnel.
- 3.2.8 Contractors do much of the maintenance performed at GPB. Management of contractor personnel and monitoring of cost is not consistent and does not appear to be uniformly effective.
- 3.2.9 Most contractor employees are qualified and are doing a good job. However, some contractor employees may not have necessary skills or qualifications to work in the areas to which they are assigned.
- 3.2.10 Budget-driven fluctuations in the contractor work force have made retention of skilled workers a challenge.
- 3.2.11 Many employees feel they spend too much time training contractors and that contractors take too little ownership of the equipment on which they work. Employees believe this lack of ownership is reflected in the quality of the work contractors perform and the time required in performing it.
- 3.2.12 Employees believe oversight of contractors could be improved in the areas of scope, cost control and worker productivity.
- 3.2.13 Employees questioned whether the same company should be performing hazard studies and then providing the engineering and construction services required to address these hazards.
- 3.2.14 Scheduling of facility turnarounds often draws contractor employees away from the regular maintenance they perform, contributing to higher maintenance backlogs.
- 3.2.15 As of August 2001, preventative maintenance backlogs for fire and gas detection systems in the WOA and for pressure safety valves across the field were too long. These are safety-critical systems.
- 3.2.16 Non-mandatory maintenance is largely reactive. Mechanical Integrity failures result in immediate action, but workers report that their long-term integrity concerns are often not addressed. Maintenance personnel in some areas report spending approximately 70-80 percent of their time in the field doing repairs instead of preventative maintenance. Maintenance personnel spend a significant amount of time on administrative matters and chasing parts instead of “turning wrenches.”

- 3.2.17 Maintenance required by regulation is given a high priority when recognized. Lapses sometimes occur because there is no management system that effectively captures and reports backlog information with appropriate visibility or defines clear accountability for delivery of compliance and operational integrity. Furthermore front line maintenance technicians are not always aware of regulatory requirements.
- 3.2.18 Management has extended inspection intervals on some equipment based on history and engineering judgment. However, the basis for these decisions has not always been well documented or effectively communicated to field personnel, many of whom view these deferrals as largely budget driven.
- 3.2.19 Spare parts inventories are inadequate and poorly managed, causing delays in maintenance activities and inefficient use of staff time. Technicians say they spend more time “chasing parts” and less time “turning wrenches” than in the past. While management has recognized this problem, there is a need for continued improvement in the availability of critical spare parts. It was reported that the existing materials management contract might contain incentives for the contractor that may not be in GPB’s best interest.
- 3.2.20 The internal CO2 corrosion control program at GPB has evolved over the years and is “best in class” within the BP system. The field Corrosion, Inspection and Chemicals team has recommended a major expansion of the external corrosion inspection program and the proposal is now being discussed by the GPB Owners. The Team supports this effort in addition to continued experimentation with newly evolving inspection technology. Management of flow-line velocity has varied for the WOA and EOA but a recommendation has been sent to Operations Management to standardize the approach. Acceptance of this recommendation should establish appropriate technical limits to maintain equipment integrity across the field.
- 3.2.21 GPB is moving to “Passport” as the single Computerized Maintenance Management System (CMMS). Currently, not all maintenance work is captured in this system; some activities are recorded in stand-alone systems and some activities are simply not recorded at all. Documentation of maintenance that is recorded does not consistently include information on the condition found, the failure mechanism, the repairs completed, the condition left or the time required to complete the work. Heavy reliance on “standing work orders” inhibits the collection and accurate reporting of this data.
- 3.2.22 There is no standard communication protocol for checking on the well-being of maintenance technicians who work alone in the field.

Recommendations

Several mechanical integrity issues require immediate attention:

- 3.2.23 Assess the extent of internal leak-through in emergency shutdown valves across the field (see Section 3.4, Production Shutdown).
- 3.2.24 Eliminate backlog in Fire and Gas Detection System inspections, including HVAC maintenance, to achieve compliance.
- 3.2.25 Eliminate backlog in PSV inspections to achieve compliance.
- 3.2.26 Accelerate flow line inspections for damage caused by external corrosion, and repair as appropriate.
- 3.2.27 A program is in place to bring all PSV and fire and gas panel inspections into compliance by the end of the year. To ensure future compliance, it is recommended that all maintenance records for PSVs, fire and gas detection systems, as well as other safety-critical systems currently in stand-alone maintenance management systems be linked or brought into Passport without delay so this information has appropriate visibility.
- 3.2.28 The field Corrosion, Inspection and Chemicals team has recommended a major expansion of the external corrosion inspection program in 2002. The proposal is now being discussed by the GPB Owners. The Team supports this effort.
- 3.2.29 A formal communication protocol should be established which would require periodic check-in by maintenance technicians working alone.

Additional Recommendations

- 3.2.30 The existing maintenance strategy must be aligned with the GPB strategic business plan. Employees need to feel ownership of the strategy so that their actions/goals support its implementation.

The Maintenance Strategy must contain these components:

- Assurance of mechanical integrity and regulatory compliance
- Definition of maintenance requirements including “safety-critical”
- Effective work planning and scheduling
- Strategy for improving availability of parts
- Staffing
- Metrics (Key Performance Indicators (KPIs)) and performance monitoring systems that enables managers to determine if KPIs are being achieved.

- 3.2.31 The current GPB Maintenance Strategy contains a “people” component that should be strengthened in the technical development area. In the past, GPB has relied on unstructured on-the-job training. The quality and content of on-the-job training has diminished as staffing has been reduced. The Team recommends that maintenance technicians receive formal refresher training annually. While computer-based training has a role in the maintenance training program, classroom instruction should be provided as appropriate to allow technicians to obtain answers to their questions through discussion of complicated systems with technical experts.
- 3.2.32 The majority of the GPB maintenance effort should be focused on preventative/predictive maintenance. Preventative maintenance (PM) activities should be prioritized based on safety and production criticality and regulatory compliance. A standard process and discipline will be required to ensure preventative maintenance on safety and production critical equipment is completed as scheduled and that the amount of low value work is minimized. To properly manage safety-critical work, the Team recommends:
- Categorize all GPB equipment using the BP Safety-Critical Decision Tree.
 - Based on the results of the decision tree categorization, review, revise or establish field wide PM procedures, including frequency, for all safety-critical equipment. Input frequency and procedures into Passport by end 1Q 2002.
 - Perform safety-critical PM and safety-critical work orders within prescribed timelines.
 - Report safety-critical PM and breakdown work backlog information to Operation Team Leaders (first line supervisors) monthly, and to second line management quarterly, so that trends are transparent to all at all times.
- 3.2.33 Currently, in the WOA contract workers perform most preventative maintenance in the facilities. BPXA maintenance technicians do most repairs. It is recommended that a team containing Operators, Maintenance Technicians, Operations and Operations Support work together to define how Maintenance activities are performed in the future. Management should require the careful selection, training and retention of workers involved in maintaining safety-critical systems, to ensure that they are competent and appropriately licensed. This would result in adequate staffing for completion of mandatory inspections and preventative maintenance and hence improve the quality and productivity of teams working with complex systems. Management should consider in-sourcing safety-critical maintenance personnel.
- 3.2.34 Review GPB maintenance organizations to capture the field wide benefits which would be delivered by a centrally organized, but facility-based maintenance effort. In a restructured organization, it should be clear who within

BP is accountable for oversight of contractors, maintenance performance and regulatory compliance. Facility planners should work closely with the maintenance lead technician to coordinate all maintenance work in a facility and have close communications with operations personnel. GPB management should work with maintenance and operations workers in completing this organizational review.

- 3.2.35 Warehouse/parts strategy needs to be aligned with equipment maintenance strategy. Representatives from Operations, Operations Support and the Reliability Team Materials Optimization Project should review stocking policy for safety and production critical equipment components. The materials management contract should be reviewed and revised as necessary to ensure parts are available at GPB to maximize equipment up time and keep safety-critical systems effective and to ensure incentives are appropriate.
- 3.2.36 Consistent field wide maintenance procedures should be developed. A review should be commissioned to determine the adequacy of maintenance procedures for systems and equipment, the consistency of those procedures across the field, and the content of those procedures. In addition, procedures must be current and readily available to the technicians.
- 3.2.37 The Team supports GPB's move to a single CMMS system across the field. Adequate training on the Passport system for the new users is essential. Feedback on effectiveness of training should be solicited from new users. Worker accountability is needed to ensure maintenance data is input onto CMMS in a timely manner.

Other Specific Maintenance Related Issues Raised

Findings

- 3.2.38 **Documentation concerns:** Revisions to drawing that have been sent to Anchorage are not always completed in a timely manner. The turnaround on final "as built" returned to the field has been as long as two years in some cases, although the situation has improved lately. Revised "as built" drawings are not always readily available to staff while work is progressing in Anchorage on reissued drawings (e.g. electrical drawings).
- 3.2.39 **Tracking of action items to closure:** A review of actions contained in the report on the 2001 D-pad spill revealed that recommended follow-up actions had not been entered into the company's computerized action tracking data base.
- 3.2.40 **Management oversight of defeated safety log:** A firewater line was taken out of service and placed on the defeated safety log for over six months

without corrective action and proper management review. At the time of this report it remains on the defeated safety system log.

- 3.2.41 **Management of Change (MOC) system:** On some occasions, substantive changes have been made which were not handled using the established MOC system or did not comply with the requirements of the MOC system. There is confusion around whether the MOC process applies to temporary changes and non-production departments. The MOC element under the OSHA PSM rule requires that temporary changes be managed by an MOC process.
- 3.2.42 There is a common MOC Procedure Task Force developing an integrated MOC procedure for GPB. The current draft procedure deals mainly with the stages and steps involved with implementing a MOC. It is not a complete management system because it fails to discuss the purpose, scope, definitions and applicability of the MOC process.
- 3.2.43 The tracking of follow-up on open MOCs is not adequate. In the WOA, there is no single point of contact (SPOC) because the person responsible for tracking open MOCs was reassigned and not replaced.
- 3.2.44 **Drill site operations quality control:** There is no formal procedure for the transfer of responsibility for wells between the operations group and the drilling and well work organizations.
- 3.2.45 **Qualifications of contractors:** WOA workers expressed concern about the qualifications of some of the contract companies and workers at GPB.
- 3.2.46 **Snow removal:** Snow removal is not always completed in a timely manner. Employees reported that delays in snow removal could impact emergency response and work activities such as checking well houses on a daily basis.

Recommendations

- 3.2.47 Set a target range for the desired backlog of as-built documentation and set a near term budget to bring the current backlog into range. Long term, the budget should be set to maintain the backlog within the target range. Keep a copy of revised drawings available to the workforce until completed "as built" drawings return from Anchorage. Consider providing CAD access capability at the facilities.
- 3.2.48 The existing computerized action-tracking database needs to be better utilized, especially regarding actions from Loss Control Incident Report investigations. Provide orientation training on the use of this database.

- 3.2.49 The defeated safety log procedure should be modified to increase the frequency of senior management review to ensure actions recorded in the log receive proper visibility and attention.
- 3.2.50 The Common MOC Procedure under development at GPB should include a references section that refers to other documents that state the purpose, scope, definitions and applicability of the MOC management system.
- 3.2.51 Field wide refresher training is needed on the MOC process, especially regarding applicability and what constitutes “not-in-kind” and temporary changes. This should be included in the roll out of the new Common MOC Procedure.
- 3.2.52 There should be a single point of contact for management and administration of the field wide MOC system whose responsibilities include tracking open MOCs to closure. Status reports should be issued quarterly to OTLs.
- 3.2.53 All maintenance on wells should be initiated with a permit that the drillsite Operator signs when work is initiated and completed. This will ensure that the operators know who is on their pads and what they are doing. It will also facilitate inspection of job sites when work has been completed.
- 3.2.54 Review bid documents and contractor qualification procedures including safety and drug testing programs to ensure that only qualified contractors are awarded jobs. Develop specific skill requirements for contractor employees.
- 3.2.55 Ensure sufficient manpower and equipment is available during winter months to provide timely snow removal.

3.3 Fire and Gas Detection

Primary Question

Are current fire and gas detection and suppression systems safe and are plans to deal with obsolescence adequate?

Answer

The original systems still function as designed. However, the systems are old, portions of them pre-date current code and replacement parts are difficult to obtain. Maintaining these systems is becoming increasingly time-consuming and complex. The technicians responsible for maintaining the systems are very concerned about continuing degradation of reliability.

Significant progress has been made towards development of a state-of-the-art fire and gas detection system to replace that in use since field start-up. System requirements have been defined for every facility in the WOA and a pilot system has been installed, tested and evaluated. GPB has sought approval of the new system by state regulators and listing organizations prior to undertaking field wide upgrades. The Team strongly recommends upgrading the fire and gas systems.

Findings

- 3.3.1 Repair activity levels have increased as fire and gas detection equipment reliability has decreased with age.
- 3.3.2 Because existing fire and gas detection systems are 25 years old, obtaining parts for repairs is becoming increasingly difficult. Technicians have been trained to refurbish system components in some instances because replacement parts are not available.
- 3.3.3 Workers are very supportive of efforts to upgrade existing fire and gas detection systems. Workers want additional information about the technology being proposed and are concerned about whether the GPB Owners will fund and complete the upgrades on a reasonable schedule.
- 3.3.4 At the time of this review, technician staffing was insufficient to both repair and maintain installed equipment in accordance with existing preventative maintenance schedules.
- 3.3.5 Preventative maintenance has not been completed as scheduled for some fire and gas detection equipment, including some scheduled maintenance and inspections required by regulation. A significant number of annual fire panel inspections were overdue at the time of this review. GPB management has

taken short-term steps to eliminate the backlog by providing additional contract staff.

- 3.3.6 Field management has acknowledged deficiencies in the way GPB fire and gas detection systems are maintained and is considering a proposal for addressing the current backlog and preventing future backlogs.
- 3.3.7 Employees expressed concern about the scope and frequency of maintenance on Heating, Ventilating, and Air Conditioning (HVAC) systems. HVAC systems work with fire and gas detection systems to remove low levels of gas from contained areas. They also shut down to maximize halon concentrations in process modules should there be a halon discharge.
- 3.3.8 The stand-alone maintenance database used by fire and gas technicians in the WOA does not flag potential non-compliance problems. The database is not linked to Passport, the central maintenance management system used at GPB. As a result, performance data is not readily available for failure analysis that could be used to make maintenance of the fire and gas detection system more effective.
- 3.3.9 Halon distribution nozzles at F-Pad were lowered without proper Management of Change review to ensure compliance with current codes.
- 3.3.10 The “bulk” halon system at CGF is the only one of its type at GPB. Workers report that the system leaks and that although the rate of leak-through has been reduced, efforts to halt the leaks have been unsuccessful. Data available to the team indicate that the system leaks approximately 50 pounds of halon per day.
- 3.3.11 In October 1999, a contract service company provided BPXA with a notebook of deficiency reports identified during the WOA Fire and Gas Detection System Reliability Project. These reported deficiencies have not been systematically verified, evaluated, nor, if appropriate, corrected.

Recommendations

- 3.3.12 Evaluate fire and gas system deficiencies reported by workers identified in the October 1999 notebook. Immediately correct those deemed safety critical.
- 3.3.13 Fire and gas detection system upgrades are needed. A field wide Fire and Gas Detection Technology Upgrade Program is being developed. As this program is implemented, management must ensure that the new system is code-compliant, that technicians are properly trained and qualified to install and maintain the new systems, and that replacement parts are readily available. The need for installation of carbon dioxide detectors at the Central Power Station should be investigated.

- 3.3.14 The supply of replacement parts for existing systems must be increased. Limited system upgrades in some areas should be considered in order to free salvaged parts for use in others. Warehouse staff must ensure fire and gas system parts remain in inventory and are not inadvertently surplus. Phased installation of new fire and gas detection systems should allow salvage of sufficient spare components for use in repair of existing systems.
- 3.3.15 A new strategy is needed for maintenance of fire and gas detection systems. The new fire and gas detection system maintenance strategy now being developed should be completed and given urgent consideration by management. The strategy should include an expedited review of EOA system condition, a plan that addresses current staff shortfalls and be designed so as to improve system reliability and code compliance. To create broad ownership of the strategy, management should engage workers in development, implementation and communication of the strategy.

The plan should provide for standardization of parts, repair programs and procedures across the field; improve the testing, storage and use of salvaged replacement parts and result in a fire and gas detection system maintenance database tied to Passport. This will provide better assurance of compliance and information on component reliability and failure modes. It should ensure the systematic review of deficiencies communicated to GPB management to ensure these are appropriately addressed through near-term action or as a part of the technology upgrade program.

The new maintenance strategy and staffing plan for the fire and gas detection system should cover all fire and gas detection and suppression systems at GPB including relevant HVAC systems.

Management should require the careful selection, training and retention of workers involved in safety-critical maintenance activities, to ensure that they are competent and appropriately licensed. This would result in adequate staffing for completion of mandatory inspections and preventative maintenance and hence improve the quality and productivity of teams working with complex systems. This could be achieved by in-sourcing safety-critical maintenance personnel.

- 3.3.16 Halon leakage at the Central Gas Facility (CGF) is excessive. The halon system at CGF should be surveyed to determine point(s) of gas escape and repaired as appropriate.
- 3.3.17 HVAC components essential for effective operation of fire and gas systems should be identified and appropriately maintained. Preventative maintenance procedures for HVAC systems should be reviewed to ensure that appropriate pressure differentials are maintained between classified areas. Technicians should also ensure that louvers and exhaust fans are functioning properly in

process areas to ensure effective ventilation on low gas alarms and isolation on high gas alarms. When an HVAC system is taken out of service, an entry should be made on the defeated safety device log and appropriate steps taken to communicate the condition of the module to affected personnel.

- 3.3.18 The location of F pad Halon nozzles was changed without proper review. Modifications to the halon suppression system at F-pad should be reviewed to ensure the system is still fully effective. Changes should also be reviewed with the State Fire Marshal. MOC procedures should be strengthened in accordance with the recommendations contained in the maintenance section of this report.

3.4 Production Shutdowns and Control Room Consolidation

Primary Question:

Can production be shut down safely?

Answer:

At the present time, production can be shut down safely but may require closure of manual valves by operators. Many workers believe their ability to safely shut down production has been diminished by staff reductions (see Section 3.6, Staffing) and the deterioration of the valves used to isolate production.

Overview

Workers believe internal leak-through of isolation valves (shutdown valves, divert valves, flare valves and perimeter valves) is a significant problem and under certain circumstances may pose a potential hazard to workers and equipment during both emergency shutdown and maintenance isolation.

Operators point to continued flaring after an emergency shutdown and difficulty in achieving process isolation as evidence that appreciable internal leak-through is occurring in some isolation valves. Operators report that it is rarely possible to achieve maintenance isolation without having first made use of a grease crew, which raises concern over whether the valves can hold shut-in pressure. This is a bigger concern in the WOA than in the EOA. The Team was also told that some flowline maintenance is deferred until a pad is shut down because it is impossible to establish effective “safe out” isolation with the valves available.

As part of WOA / EOA integration, a task force recommended that all ESD systems be tested on a three-year interval. In 1995 a risk-based reliability assessment was conducted on WOA ESD systems; since all ESD systems are not consistently configured, the 1995 report recommended different testing frequencies for some ESD systems.

Production shutdown – ESD valves

Findings

- 3.4.1 Workers believe internal leak-through of isolation valves is a significant problem and, under certain circumstances, may be a potential hazard.

- 3.4.2 A formal, systematic, field wide assessment of internal leak-through in isolation valves has not been completed, so the extent of this problem is not known. At the beginning of July 2001, field management conducted a pilot leak-through test on a few valves using thermographic imaging. However, there was no attempt to correlate the resulting temperature profiles with leak-through rate.
- 3.4.3 Leak-through is not evaluated during scheduled function testing of these isolation valves. Greasing of the valves generally occurs at the time of function testing or during facility shutdowns. Valve leak-through is typically addressed when it has been difficult to achieve maintenance isolation during pad and facility shutdowns. Management has recognized this employee concern. At the time of this report, high-pressure pad outlet valves in the WOA were being replaced with new “double block and bleed” valves.
- 3.4.4 The function testing frequency of ESD systems is inconsistent across the field and may not provide desired reliability. The ESD testing frequency is annually in the WOA and every three years in the EOA.

ESD – Recommendations

- 3.4.5 A team of technical experts and operations and maintenance personnel should assess internal leak-through in key isolation valves. This assessment should be the basis for maintenance, future testing and valve replacement. The assessment should define criticality of valve service and should include pass/fail criteria. The ESD circuit categorization summary for the WOA should be reviewed as part of this effort. The results of the assessment should be effectively communicated to all employees.
- 3.4.6 A preventative maintenance program should be developed for isolation valves and should consider manufacturers’ recommendations for cleaning and greasing.
- 3.4.7 Establish a reliability standard for ESD systems and then test ESD systems on a frequency that will achieve the reliability standard. The Prudhoe Bay ESD system Reliability Study (May 1995) should be review for relevancy.

Production shutdown – Surface Safety Valve Testing

Findings

- 3.4.8 Testing of surface safety valves (SSVs) does not always occur according to the written procedures for SSV testing. The written procedure for the WOA calls for the wing valve on production wells to be open when the SSV is closed for production well function testing.

- 3.4.9 There is no pass/fail criterion for SSV integrity (i.e. internal leak-through) testing. As a result, state test results are subjective and can vary depending on which inspector is present to witness the testing. State inspectors attend at least 25% of these tests.

SSV – Recommendations

- 3.4.10 Testing should be conducted according to a written procedure. Valve experts, AOGCC inspectors and field operators should review the current procedure to ensure that it provides the appropriate rigor. The procedure should include objective pass/fail criteria for the SSV leak test.
- 3.4.11 SSV test results for all GPB wells should be tracked, analyzed and periodically reported to management. Failure rate trends should be regularly identified and made available to workers, supervisors and managers.

Control Room Consolidation (CRC)

Findings

- 3.4.12 Operators feel little ownership of the CRC concept. Workers had limited involvement in the decision to implement the Consolidated Control Room for Gathering Centers in the WOA. Workers have also had limited involvement in the design and implementation of the system.
- 3.4.13 Operators are concerned that activation of the CRC will adversely impact safe Gathering Center operations by transferring process control to a distant location, impairing communication between plant and control room operators during process upsets, reducing the number of Gathering Center personnel available to address operational issues, complicating issuance of maintenance work permits, and removing some experienced and capable operators from the Gathering Center.
- 3.4.14 Operators are concerned that availability of control room training will be lost at the Gathering Centers and that mentoring opportunities will be diminished.
- 3.4.15 Operators are concerned about whether the functionality of the current distributed control system will be maintained in the new system.
- 3.4.16 About half of the new CRC operators were formerly pad operators and have limited experience in the Gathering Centers. Although they have completed

qualification training in the Gathering Centers, some plant personnel are concerned about the quality of their training and their limited experience.

- 3.4.17 Workers have questioned the adequacy of the over-pressure protection provided at skid 450 and GHX II, where closure of a perimeter valve could isolate the flowline from the Pressure Safety Valve.

CRC – Recommendations

- 3.4.18 The role of the CRC in the long-range operations strategy for GPB should be clearly articulated to the workforce.
- 3.4.19 Management should expand the role of all stakeholders in CRC development and implementation. The CRC project team should regroup and reassess the implementation plan. Representatives from the appropriate groups (automation engineering, operations (both WOA and EOA), safety, etc.) should be assembled to review the current control system design status. The concerns identified by operators should be carefully considered.
- 3.4.20 The “fast-track” training for CRC technicians should be modified, beginning with a needs assessment to determine the level of knowledge and skill needed for the CRC position. Additional training to fill any gaps determined by the needs assessment should be provided. Measurement of knowledge retention beyond that required by the electronic training system is necessary.
- 3.4.21 Use the MOC process to review the over-pressure protection for Skid 450 and GHX II at Gathering Center #1.

3.5 New Facility Design – Open-Air Skids

Primary Question:

Are new facility designs safe and operable?

Answer:

Open-air skids are generally viewed as safe because they greatly reduce the risk of explosion from all but large gas leaks. Other safety issues, such as walking surfaces and access, are viewed as less safe than enclosed skids. Workers view the more complex open-air skids as being more difficult to operate and maintained than enclosed skids. Unresolved operability issues include lack of winterization features, higher environmental risks, poor equipment selection and lack of maintenance/access features. The focus of the Team study was on open-air skid design. Other new facility design issues were not addressed.

Findings

- 3.5.1 Open-air skid design has been adopted as the preferred design for new GPB well pads. Open-air skids are less expensive to build than enclosed skids. Open-air skid designs greatly reduce the risk of explosion from all but large gas leaks because leaks dissipate before gas concentrations can reach explosive levels.
- 3.5.2 There are eight open-air skids of varying complexity in GPB. Two more are being installed.
- 3.5.3 Many GPB workers do not view the more complex open-air skids favorably and expressed a preference that all skids be enclosed.
- 3.5.4 Operation and maintenance of open-air skids are more difficult during much of the year, because workers and equipment are exposed to Arctic conditions.
- 3.5.5 Workers feel their input was not incorporated in the design of open-air skids. Many believe designs were driven by capital cost considerations alone.
- 3.5.6 New skid designs seem to accept higher maintenance costs in order to save initial costs. On some skids there is no insulation / heat tracing, no lifting devices, no enclosed instrument shack, equipment and fittings are too closely packed for access and maintenance, and valves are too high for operators to easily access.
- 3.5.7 Future skid designs and operability will impact future staffing decisions.

- 3.5.8 The impact of wind-packed snow build-up has not been adequately addressed in open-air skid designs. Blowing snow can “pack” these facilities resulting in uneven and unsafe walking surfaces and inhibiting access to valves and other skid components. Removal of packed snow from skids increases the time and cost of even simple maintenance activities.
- 3.5.9 Open-air skids with lined secondary containment installed beneath them will not contain spills, especially wind blown sprays, with the same effectiveness as enclosed skids. Gas detectors often alert operators to leaks in enclosed skids. Gas detectors have not been installed on existing open-air skids and would probably not be effective. Leak detection at open-air skids depends on direct observation by field personnel.
- 3.5.10 Facility designers appear to have taken a renewed interest in feed back form the field. Actions are being taken to address worker concerns in the retrofitting of some existing open air skids and the design of new skids. This is seen as an encouraging development but follow through will be important to rebuild trust. These proposed actions include:
- One skid on Z and E pads will be modified with experimental wind walls for winter 2001
 - Independent experts have been contracted to perform dispersion modeling to evaluate oil spray and snow buildup on open-air skids
 - Heat tracing on Z-pad will be increased from 5 watts/foot to 10 watts/foot
 - Borealis skids (L and V-pads) will include access platforms for high valves, lifting devices and monorails, automatic divert and gas lift valves and may include new technology for fire and gas detection.

Recommendations

- 3.5.11 To correct current design issues with existing skids, skid designers should critically review design requirements against known operability issues. GPB management should establish a field input feedback loop for assigning and resolving issues.
- 3.5.12 Designers should install, test and evaluate skid modifications that could correct known issues. Success of these modifications should be measured against objective criteria. Management commitment to making modifications and evaluating options should be very visible.
- 3.5.13 Perform an in-depth risk and life-cycle economic review of future skid prototypes to objectively compare initial costs to long term operating and maintenance costs. Make this review transparent so that stakeholders understand the trade-offs involved. Use this work to develop minimum design standards so that inappropriate design compromises are avoided.

3.5.14 Communicate design changes and any revised design approach to interested employees. This should be accompanied by a message from management clarifying that worker safety and environmental stewardship continue to be primary goals in this area.

3.6 Staffing

Primary Question:

Are there enough people for handling operations during normal and upset conditions?

Answer:

Within the Production Operations Department, current staffing is adequate to handle operations under normal operating conditions. However, workers feel that operations staffing is not sufficient in some areas of the field to allow for normal operations together with training, increases in work activity, vacations and other absences, or to prevent escalation of process upsets.

Findings

- 3.6.1 Some short term changes in field staffing levels made in response to immediate budget pressures appear arbitrary.
- 3.6.2 Workers believe management has ignored their input in establishing current staffing levels for both operations and maintenance.
- 3.6.3 **Operations staffing** – There is general agreement that staffing is adequate to handle operations during normal conditions. Many workers are concerned that operations staffing is not sufficient during periods of high maintenance activity or to prevent escalation of process upsets, even though management has directed operators to shutdown wells, equipment or facilities if operators doubt their ability to control such upsets by other means.
- 3.6.4 Normal-condition monitoring and response to routine process alarms (not necessarily during process upset conditions) is sometimes delayed during periods of high activity. These delays may increase the likelihood of process upsets occurring.
- 3.6.5 Internal leak-through in shutdown valves often requires operations personnel to manually close additional isolation valves.
- 3.6.6 Deferred preventative maintenance increases the likelihood of equipment breakdown and may contribute to process upsets.
- 3.6.7 **Emergency response staffing** – Workers report that the Emergency Response (ERT) and Spill Response Teams (SRT) have a difficult time maintaining a full compliment of trained responders. This could impact the ability of these teams to effectively respond to emergencies.

- 3.6.8 WOA workers are concerned that staffing on some facilities is not sufficient to allow rescue by facility personnel. In the WOA, the emergency response policy is to wait until ER team responders arrive to assist with “man down” situations. Response time to some facilities, depending on weather, can be thirty minutes or more. In the EOA, operators have been trained as responders, but staffing levels in some areas would inhibit proper response.
- 3.6.9 **Maintenance staffing** – Technicians report spending approximately 50% of their time on activities other than “turning wrenches.” These activities include administrative tasks, training, safety meetings, research, chasing parts and travel time. The high backlog in certain maintenance activities indicate that staffing in some areas is not sufficient. A high turnover rate among contract maintenance technicians in some groups has exacerbated this problem.

Recommendations

- 3.6.10 Management should review long term staffing levels after completion of the revised GPB business plan and operating philosophy. Staffing decisions should be consistent with the business plan.
- 3.6.11 Management should consider input from operations and maintenance workers when making staffing decisions and communicate to employees how their input was considered.
- 3.6.12 **Operations** – Management should review operations staffing levels on a facility-by-facility basis to ensure there is adequate staff to prevent escalation of process upsets into “loss of control” incidents. Staffing decisions should consider safety, operating conditions, activity levels, workforce renewal, appropriate use of staff overtime, and planned absences for training, vacation and illness.
- 3.6.13 **Emergency Response** – GPB management, in consultation with field workers, should develop a consistent emergency response policy for the field, paying particular attention to ERT and SRT staffing levels and to the concerns of employees in facilities most distant from Emergency Response Centers.
- 3.6.14 **Maintenance** – Additional workers are necessary in the near term to reduce maintenance backlogs, achieve regulatory compliance in safety-critical areas and accomplish essential preventative maintenance on schedule. Management has begun this process, bringing on additional personnel to inspect fire panels and certify PSVs. Long term staffing levels should be established to effectively implement the overall maintenance strategy and be based upon a comprehensive view of planned activities.

3.6.15 Management should require the careful selection, training and retention of workers involved in maintaining safety-critical systems, to ensure that they are competent and appropriately licensed. This would result in adequate staffing for completion of mandatory inspections and preventative maintenance and hence improve the quality and productivity of teams working with complex systems. Management should consider in-sourcing safety-critical maintenance personnel.

3.7 Other Concerns

During interviews with employees, a number of issues were raised which did not fall into any of the six categories outlined in the Team Charter. The most significant of these are discussed below.

Budget

Findings

- 3.7.1 GPB Owners have worked to hold unit lifting costs constant as production has declined in an effort to keep GPB competitive for continued investment. This has resulted in significant pressure on operating and maintenance budgets over the past decade.
- 3.7.2 Many employees expressed the view that budgets have been cut too deeply. They believe that GPB management's top priority is controlling costs and achieving short-term budget targets and not safety, regulatory compliance or delivering long term operational integrity.
- 3.7.3 Budget decision makers are not as well informed as they should be because the tools available to GPB management do not accurately track activity levels and costs on a field-wide basis. (See Section 3.2, Maintenance). Work is still not complete on the integration of the BP and ARCO heritage systems. This makes realistic activity-based Budgeting difficult.
- 3.7.4 The budget and cost tracking processes are not well understood or controlled by first line supervisors responsible for managing expenditures. The cost control system is weak. Invoices submitted by contractors for work performed in the field receive too little scrutiny because first line supervisors have too many competing responsibilities.

Recommendations

- 3.7.5 GPB management must address the broadly held perception that management decisions are driven by short-term budget objectives, not delivery of safety and long-term operational integrity. Multi-year financial plans should be developed, based on activity levels, maintenance strategy and staffing. The annual budget should cover implementation of the first year of this plan and short-term changes should be managed with the long-term objectives in mind. Affected employees should be involved in the process.

- 3.7.6 Efforts to improve field wide budgeting and maintenance management systems should be expedited so that budget decisions are better informed.
- 3.7.7 First-line supervisors should receive training on activity-based budgeting and the use of BP budget reports used for managing expenditures. GPB management should also develop a system for more effective oversight of contractor labor and materials charges.

Training

Two distinctly different areas of training are required in the operation of GPB. The first is the training required by government regulations. The second area is related to specific, on-the-job training required to perform tasks safely and efficiently, refresher and skills enhancement training for technicians and development training for potential leaders.

Findings

- 3.7.8 Many experienced GPB personnel are nearing retirement. The effectiveness of new employees will depend in large measure on the quality of the training provided to them.
- 3.7.9 Employees are concerned about the scope and quality of training programs at GPB. Employees want training and are doing their best to use the tools available to them. They believe budget reductions have limited the training programs and opportunities available to staff.
- 3.7.10 Few employees know that BPXA guidelines encourage employees to participate in 3-5 days of additional relevant training per year.
- 3.7.11 Completion of training is largely self-directed. Many workers are not experienced in researching training opportunities. Employees believe obtaining time for additional training will be difficult due to staffing levels.
- 3.7.12 Employees are expected to maintain their own Process Safety Management training. Managers do not effectively use the existing tracking system to ensure required training has been accomplished.
- 3.7.13 Experienced operators believe the training required for periodic operator re-certification under PSM should be more rigorous. Operators believe the quality of this training has been diminished by heavy reliance on E-book computer-based training, elimination of classroom coursework and the reduced ability of lead operators to spend time training less experienced workers.
- 3.7.14 Lead Operators do not receive leadership training.

3.7.15 Technical training is not occurring for many craft workers. This is especially true for the mechanical crafts.

Recommendations

3.7.16 Clarify the GPB training policy, using BP training guidelines, and communicate it clearly to all employees.

3.7.17 Encourage first line supervisors to promote and support training in accordance with BPXA's training policy. Each employee should be encouraged to create a development and refresher training profile. Staff should be helped to identify or organize relevant training opportunities. Equipment vendors should be encouraged to provide training on the job.

3.7.18 Self-directed and computer-based training can be effective, but should be periodically reviewed by management and employees to ensure appropriate rigor and should be augmented with classroom training when necessary.

3.7.19 Review mandatory regulatory training requirements for each position to ensure training requirements and content are appropriate.

3.7.20 Managers should make more effective use of tracking tools to ensure required training is being accomplished.

3.7.21 The Alaska Leadership Team has committed, as part of "People Team 2," to implement a new learning management system to be implemented in 4Q 2001. Management should seek input from employees prior to implementing this program to ensure it is relevant for GPB.

3.7.22 Provide leadership training to employees identified as future leaders.

Emergency Response and Emergency Communications

Findings

3.7.23 Emergency Response Teams are suffering low morale due to high turnover and lack of training opportunities due to staff shortages. Contract personnel play important roles in GPB response teams.

3.7.24 WOA employees are concerned that relocation of the field wide central Incident Command Center to the EOA will diminish response capability because

personnel with in-depth knowledge of WOA facilities and operations will not be appropriately represented as part of the Incident Command Center staff.

- 3.7.25 Four or five WOA fire captains also work as pad operators and hence are not always immediately available to respond as fire captains to emergencies.
- 3.7.26 Radio communication between operators is not standardized across GPB; this has inhibited effective communications during emergencies. A security officer indicated three types of radios are required to communicate across the field.
- 3.7.27 Emergency dispatches are handled differently in the WOA and EOA. GCI telephone operators handle dispatches at WOA but security personnel handle emergency dispatch in the EOA. Employees believe security personnel are better trained to handle emergency communication than telephone operators.

Recommendations

- 3.7.28 GPB management, in consultation with field workers, should develop a consistent emergency response policy for the field, paying particular attention to ERT and SRT staffing levels, the availability of employees and contract personnel and to the concerns of employees in facilities most distant from Emergency Response Centers.
- 3.7.29 Radio frequencies and emergency communication procedures should be standardized across GPB. All workers should be instructed in the proper use of radio equipment and emergency frequencies.