



International
Association
of Oil & Gas
Producers

Human Factors



...a means of improving HSE performance

Human factors defined

Human factors is the term used to describe the interaction of individuals with each other, with facilities and equipment, and with management systems. This interaction is influenced by both the working environment and the culture of the people involved. What may be a good system of work in one part of an organisation, may be found to be less than ideal in a region where culturally driven attitudes to risk taking may be significantly different.

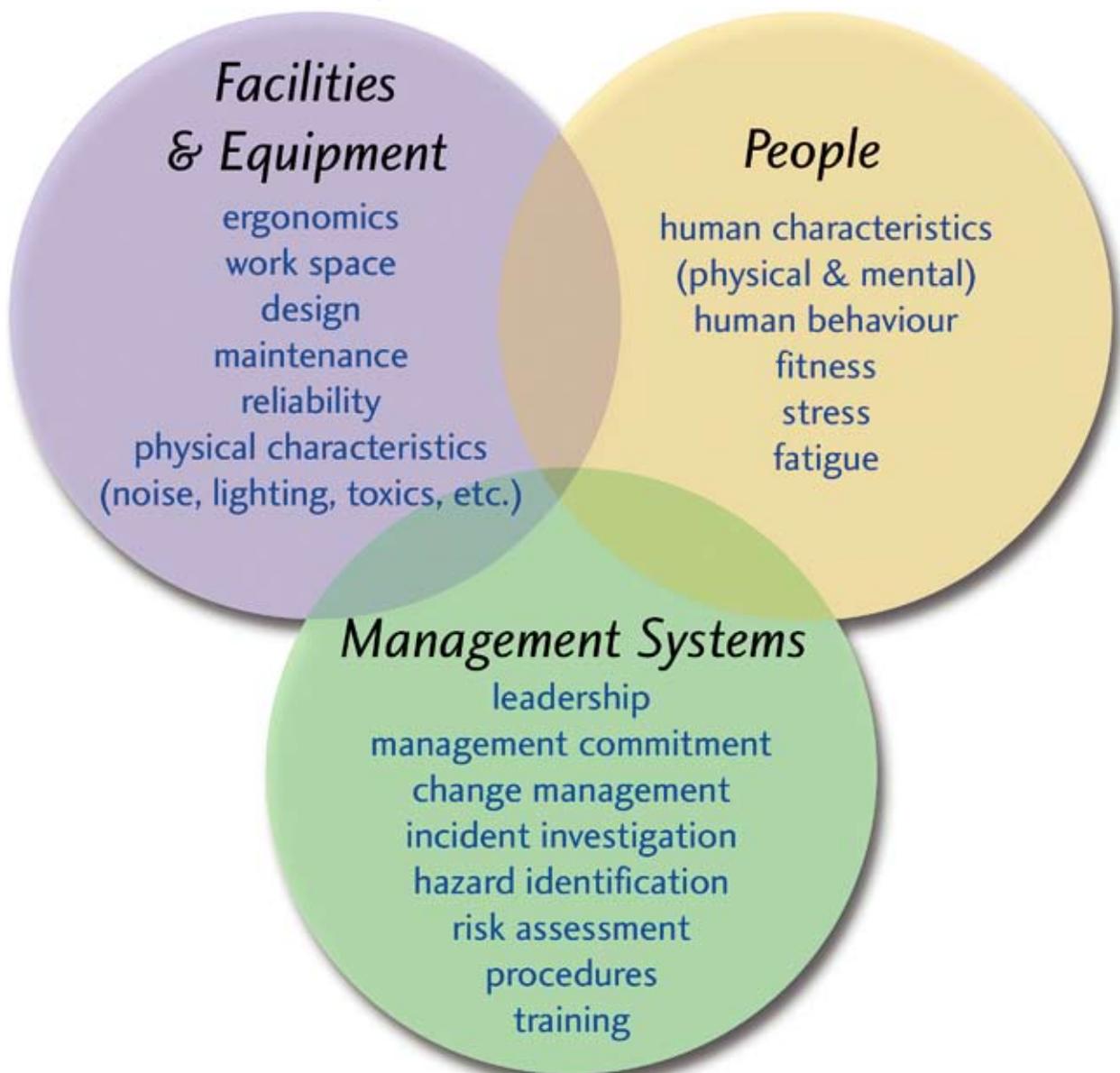
Human factors analysis focuses on how these interactions contribute towards the creation of a safe workplace.

Traditionally, the development of Health, Safety and Environmental Management Systems (HSEMS) has concentrated on the facilities and equipment to be used and the management systems themselves. Although human error has been recognised as part of the risk contribution, the root causes associated with particular types of human error have been difficult to address.

This brochure is aimed at assisting line management and HSE professionals to understand how the HSEMS can incorporate human factor issues. It has been produced by the OGP Human Factors working group.

Culture & working environment

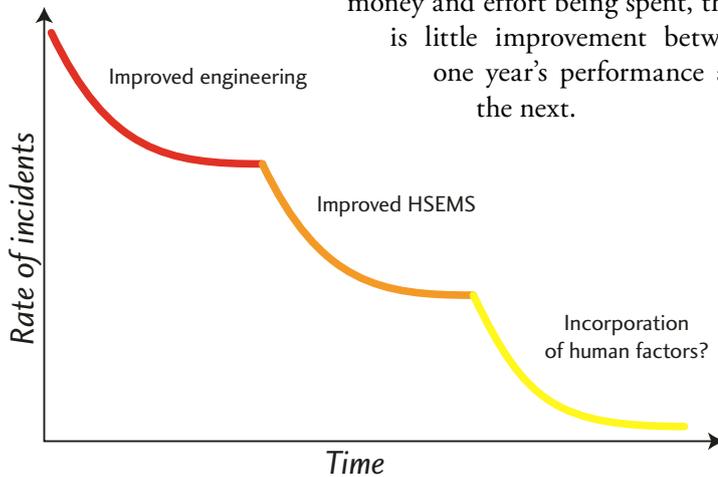
*national, local & workplace cultures,
social & community values*



Human factors

Over the past two decades, the upstream oil and gas industry has been successful in reducing incident frequency by adopting improved engineering solutions and sophisticated safety management systems.

However, safety performance has reached a plateau in many companies: despite all the money and effort being spent, there is little improvement between one year's performance and the next.



How can we achieve further improvements in HSE performance?

Progress will come by taking better and more explicit account of the way people interact with every aspect of the workplace; in other words, incorporation of Human Factors.

We need to consider how individuals interact with each other, facilities, equipment, and management systems. All of this, in turn, has to be understood within the context of the local culture and environment.

What are the benefits of taking human factors into account?

- Fewer accidents
- Fewer near misses
- Reduced potential for human error and its consequences

Although the focus of this brochure is on improving HSE performance, incorporating human factors into an HSE plan can also yield operational benefits, including:

- Improved efficiency (increased reliability/reduced downtime)
- Lower lifetime costs associated with the maintenance and re-engineering of systems
- A more productive workforce

This brochure aims to raise the awareness of the significance of human factors in achieving improved HSE performance. It provides the basic information to determine when and how this fundamental component should be factored into HSE activities.

Case study

Management commitment drives HSE performance

An Offshore Production Operation Management Team addressed the question "How can we improve and raise our HSE performance to the next level?"

They determined that management commitment and leadership was the primary driver, generating employee involvement with shared responsibility based on open and honest communication. The result: HSE as an integral part of day-to-day business.

To accomplish this there were a number of programme and organisational changes. These included:

- Highlighting HSE performance reports at quarterly employee meetings
- Management attendance at all field safety meetings
- Incident investigation reviews
- Communicating and supporting HSE initiatives and accomplishments
- Featuring HSE objectives in performance reviews for managers and supervisors
- Expectation that employees would 'shut the job down' if conditions became unsafe.

Benefits

- From 1998 to 2000, combined employee and contractor incident rates were reduced by:
 - 71% for Total Recordable Incidents
 - 100% for Lost Time Incidents
- Enhanced savings/profits due to less property damage; reduced medical expenses, compensation/insurance costs, and legal fees; fewer replacement workers; less equipment downtime.
- Improved company image and reputation.

Lessons learned

- Not a quick fix/overnight exercise; progress takes years.
- An integrated programme is necessary
- Senior management support for cultural change is essential for credibility and effectiveness.



E&P experience with engineering, systems and human factors

Even with the implementation of engineering controls and HSE management systems, E&P companies are still searching for ways to improve performance. Some E&P companies are implementing tools and technologies from other industries to improve efficiency, productivity, and minimize errors in the workplace. A survey of OGP members revealed that the top ten human factor issues involve systems, people, and culture. Facilities and equipment issues, whilst important, were considered less critical. This reflects the industry interest to balance systems and engineering controls with people interface issues.

Culture/Working environment

- Social and Community values
- Communication flow within an organisation
- Acceptance and willingness for change
- Language, geography, climate
- Management support of safety values

Management Systems

- Compatible organisational goals
- Job safety analysis
- Quality of operating procedures/work practices
- Clear interfaces/responsibilities/accountability
- Risk management
- Safe working practices
- Work/task design issues
- Leadership

People

- Fatigue and stress
- Training systems
- Workload and shift schedule
- Behavioural safety
- Physical and mental fitness

Facilities/Equipment

- Ergonomics
- Design
- Maintenance
- Reliability
- Physical layout of facilities and site
- Noise, lighting, toxics, radiation



Case study

Application of human factors to a new project

The owners of a large-scale onshore and offshore development agreed to incorporate human factors engineering (HFE) into the base design and philosophy of a new operation.

Action

With senior management endorsement, HFE professionals helped to produce a human factors programme based on seven key principles.

- 1 Involve HFE early in the project
- 2 Assign an HFE champion
- 3 Locate capability in engineering departments
- 4 Base programme on accepted HFE design standards
- 5 Involve an HSE professional in appropriate tasks
- 6 Design facilities either to eliminate or minimise human error and to mitigate errors that may occur
- 7 Extend influence of HFE beyond facility design

Implementation

With the approval of an “HFE champion”, work instructions outlining HFE expectations were issued to project staff. Technical staff training started immediately. HFE professionals were included as part of the engineering team.

Impact

Component rearrangements (relocation of heat exchangers, orientation and elevation of large valve components, deluge pipe simplification) comprised the majority of HFE changes. Because these rearrangements were incorporated early in the design process, their cost was minimal.

Human factors also influenced procedures development, training, labeling and signage to enable efficient and effective training.

The HFE programme introduced a number of standardised designs for the project, including a ladder design specifically covered by one of the HFE guides.

Results

Project HFE costs reflect personnel charges only. HFE driven design changes were considered design development. The original estimated cost for the HFE programme was 0.07 percent of the facilities budget. The actual HFE cost for this project was approximately half of the estimate.

What should your organisation be doing?

Would HSE performance improve if your organisation gave explicit consideration to human factors?

One way to determine whether human factor issues should be addressed directly is by assessing the HSE culture of your organisation.

Alternatively, benchmarking the performance of your organisation against others can indicate where there is room for improvement.

Incident investigations also provide another good source of data. Properly performed, they can give clear insight into potential problem areas related to human factors. Similarly, diagnosing known problem areas provides valuable information for directing future improvements.

Leadership and commitment

HSE culture is largely determined by the management's leadership and commitment. Change for the better will not happen without these factors (see case study *Developing a leader accountability agreement*).

Assessing HSE culture

Culture has a major impact on personal HSE behaviours. The simplest way to evaluate your organisation's HSE culture is to discuss it with both management and workforce. Gauge their perceptions by using a recognised tool such as the five step *HSE Culture Ladder*.

The HSE Culture Ladder allows an organisation (or a part of an organisation) to determine where it sits on a scale of improving HSE culture.

One extreme (*pathological*) displays a failure and lack of willingness to recognise and/or address those issues which may result in poor safety performance.

At the other extreme (*generative*) safe working practices are viewed as a necessary and desirable part of any operation.

Descriptions of 20 critical HSE elements and the definitions of actions and behaviours at each level can be found on the OGP Human Factors website (<http://info.ogp.org.uk/hf>).

The challenge for each organisation is to recognise its own safety culture and identify how it may be improved.

Surveying the workforce is an effective way to gather the data needed for assessment. Consider using one of the many organisations accustomed to undertaking this complex research to assist in conducting the effort.

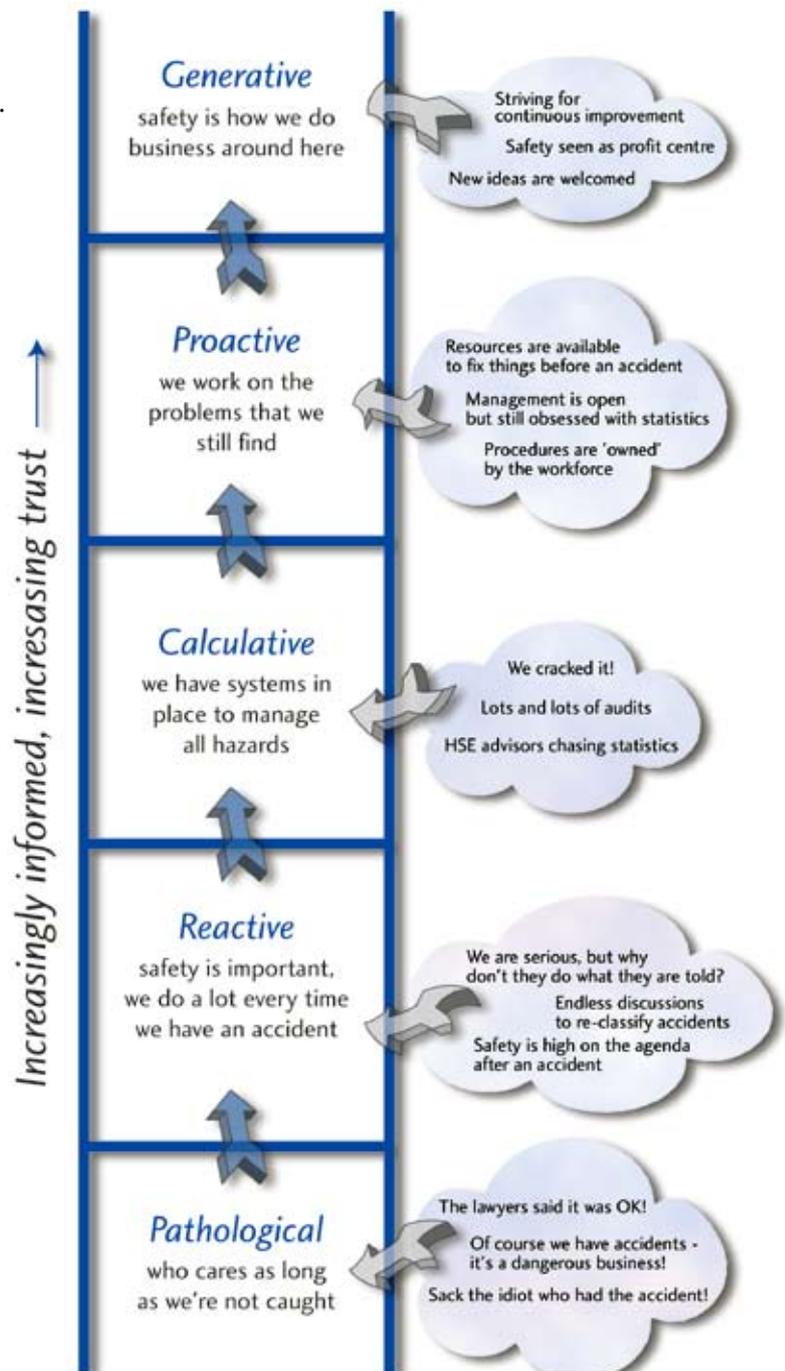
Compatibility of culture?

A particular challenge for E&P companies is assuring compatibility of their company culture with those of their contractors and subcontractors. This is particularly the case in instances where there is not a long-term business relationship. The relationships that work best are those that foster strong, compatible cultures.

What is culture?

Culture can be defined as *shared values* (what is important) and *beliefs* (how things work) which interact within an organisation's structure and *control systems* (our emphasis) to produce *behavioural norms* (the way we do things around here).

Uttal, B. (1983), *The corporate culture vultures*, Fortune Magazine, 17th October.



Identifying problem areas

Several techniques can indicate potential human factors related problems. These vary from specific surveys – such as procedure violations, ergonomic problems, stress reviews – to more general surveys covering a number of issues. Some surveys will lead to improvement actions. Others confine themselves to diagnosis.

Survey tools provide a good way to identify potential areas for improvement, particularly for organisations in which there is little feedback from incidents. However, they are not in themselves immediate solutions for addressing change.

Benchmarking

Benchmarking HSE performance can provide valuable insights. This type of benchmarking can be done at the local level by comparing one installation with another. At a higher level, an organisation may compare its overall HSE performance with that of others.

There are many different types of benchmarking exercises. Safety performance data presented in the OGP report *Safety Performance of the Global E&P Industry* is an example of an industry-wide benchmarking exercise. At a more detailed level, you can compare the performance of individual organisations on specific tasks.

Incident investigation

Analysing the root causes of incidents (and near misses) provides a unique opportunity to gain an important insight into safety culture and identify possible problem areas.

Incident analyses generally establish the sequence of events and the primary causes. For example, the outcome of an incident investigation may be “...the incident resulted from a worker failing to secure the drill pipe in accordance with company policy”.

Your ‘solution’ may be to improve the quality of supervision for this particular type of operation. However, taking human factors into account, you may learn more by determining why the worker failed to recognise, or chose to ignore, the risk at hand. For example, is there a local company culture which promotes task completion ahead of operational safety?

A range of tools can help in structuring incident investigations to ensure that root causes are uncovered. Examples of incident investigations include TapRoot®, Tripod Beta®, Why Tree Analysis, SCAT, etc.

Well run organisations can operate for many years without a major incident. That is why it is essential to share the learnings from each incident analysis as widely as possible.



Case study

Plan for improvement

A drilling organisation developed a plan to promote leadership visibility, individual accountability, and highly visible actions to improve HSE performance. This was in conjunction with roll out of a HSE Management System and specially focused contractor safety initiative.

Leadership visibility

The drilling vice president clearly communicated the emphasis on safety and that managing safety is no different from managing any other performance variable. He consistently asked about HSE within the normal course of business discussions with his team leaders. A team leader was designated as the safety champion to ensure proper data collection and analysis, to discuss HSE issues during team leader meetings, and to supervise a group of HSE professionals.

Individual accountability

The drilling vice president established safety goals to halve incidents in the first year and to achieve/maintain top quartile performance. The HSE management system spelled out roles and responsibilities for team leaders and rig supervisors, and performance reviews based on these expectations. Safety metrics were included in incentive programmes throughout the organisation.

Highly visible actions examples

Team leaders were required to report all lost time incidents to the drilling vice president. Rig supervisors, translators or specialised training were allocated to ensure work was performed safely. Common management actions included returning bids because of unacceptable safety performance on prior job, hosting an interactive safety forum for contractors with involvement by management, and suspending drilling operations when a rig experienced a high level of recordable incidents.

Benefits:

- Since 1998, combined incident rates for employees and contractors were reduced by 70% for lost time incidents and by 60% for total recordable incidents
- Embedded HSE considerations in the business process
- In 1999, moved from 4th quartile to 1st quartile in safety performance

Lessons Learned

- Implement focused safety management systems with special emphasis on leadership visibility, line management accountability, and the achievement of tangible goals.

How are improvements made?

Improvements in HSE performance occur when people, culture, working environment, management systems and facilities/equipment are managed effectively together. The steps to improvement are no different from those employed within any change management system.

It is important that account is taken of the human factor issues associated with implementing any change. Two issues of particular importance are management leadership and readiness for change.

Those individuals with key responsibilities for implementing any change should receive training in human factor fundamentals and tools.

The implications of implementing a new system of work must be recognised and accepted by both the management and the workforce. There is no use telling a worker to spend more time assessing the risks associated with a particular task if the management does not make more time available, and the worker does not recognise the benefits that should result.



Establishing where we are

- audits, site visits & inspections
- hazard reporting
- incident analysis
- root-cause analysis

Establishing where we want to be

- benchmark HSE performance against others
- external & internal surveys
- statistical & trend analyses

How we get there

- gap analysis
- establish the resources available to bridge the gap(s)
- understand the culture of the organisation, in particular its readiness to change
- develop an action plan
- implement & track changes

Case study

Developing a leader accountabilities agreement

To define leadership accountabilities better within an E&P technology department, a 4-member team developed an 'Accountabilities Agreement'. The multi-functional team reviewed existing company policies/procedures and regulatory requirements and compiled all leadership accountabilities on one page. The document was then reviewed and approved by the safety and health committee.

The team then developed an implementation programme for team leaders. A manual was developed with excerpts from company policies, procedures, HSE manuals and communications to support or provide additional information on the leadership accountabilities. Team leaders attended a training session sponsored by the company leader and each team leader signed an agreement. The accountabilities are incorporated into each leader's performance review with a specific objective related to their operations

Benefits

- All team leaders, as well as employees, were able to articulate an HSE related objective for their performance review
- Team leaders became visibly more active in HSE issues such as reporting, investigating and follow up on incidents
- Active/timely follow up on reported HSE hazards
- Increased visible support of HSE issues from leadership
- Increased awareness of HSE issues specifically related to job function
- Ownership of HSE issues and processes
- Increased leadership in areas outside those defined on the accountabilities agreement.

Lessons learned

- Use a cross-organisational team, including representatives from leadership, which promotes employee ownership
- Rely on existing policies, procedures, etc. for information when compiling the accountabilities and training material
- Use all members of the team to present the material to the leadership ranks (not only the HSE professional)
- Keep it simple – the document is a one page agreement and the guidance manual consists of copies of excerpts from existing HSE sources.

Planning for change

Before implementing a human factors change initiative, it is important to determine the organisation's readiness for change.

In general, there are five stages: pre-contemplative, contemplative, preparation, action & maintenance.

Associated with each stage are certain actions that are essential to secure the proposed change. For example, if an organisation falls into the pre-contemplative category, then the strategy for change must include raising awareness of the need and benefits which will result from the change.

Initiative overload, the perception that too much is happening too soon, should be avoided. A key to success is "integrating" human factors into existing systems and processes, not trying to work it as a stand-alone independent effort.

Provide appropriate communication and training to the parties who will be implementing the change, and to those who will be affected by it.

Readiness for change

Pre-contemplative

We don't see a problem

Contemplative

We are aware of the problem but don't know how to solve it

Preparation

We have a plan to improve

Action

We are working to improve

Maintenance

We have achieved improvement and are holding on to it

Actions to secure change

- Raise awareness of the problem areas
- Create a need in individuals
- Make the outcome believable and achievable
- Provide information about success
- Develop personal vision
- Construct a feasible plan
- Define measurements of success
- Make everyone publicly commit to their plans
- Carry out the plan
- Review progress
- Perform management review
- Secure outcome

Useful resources

Websites

OGP Human Factor issues area, <http://info.ogp.org.uk/hf>

- Contains key references and links to Human Factor websites & information.

Step Change, <http://step.steel-sci.org>

- References and links on items to improve safety performance, awareness and behaviours in UK oil & gas industry.

References

Guidelines for the development and application of health, safety & environmental management systems, OGP report ref. 6.36/210, <http://www.ogp.org.uk>

Reducing Error and Influencing Behaviour, HSE books, HSG48, ISBN 0717624528. <http://www.hsebooks.co.uk>

- Provides information to assist personnel with H&S responsibilities to understand and incorporate Human Factors into the workplace.

Changing Minds - A Practical Guide for Behavioural Change in the Oil & Gas Industry, Step Change Publication, <http://step.steel-sci.org>.

- Focuses on safety and behavioural issues and illustrates the organisation factors required to manage safety effectively.

Improving Maintenance; A guide to reducing human error, HSE Books, ISBN 0717618188. <http://www.hsebooks.co.uk>

- Covers maintenance risks, human performance in maintenance, assessment methods, maintenance management issues, and includes worksheets.



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Who are we?

OGP encompasses most of the world's leading publicly-traded, private and state-owned upstream oil & gas companies, oil & gas associations and major upstream service companies. OGP members produce more than half the world's oil and about one third of its gas.

Mission

- To represent the interests of the upstream industry to international regulatory and legislative bodies.
- To achieve continuous improvement in safety, health and environmental performance and in the engineering and operation of upstream ventures.
- To promote awareness of Corporate Social Responsibility issues within the industry and among stakeholders.