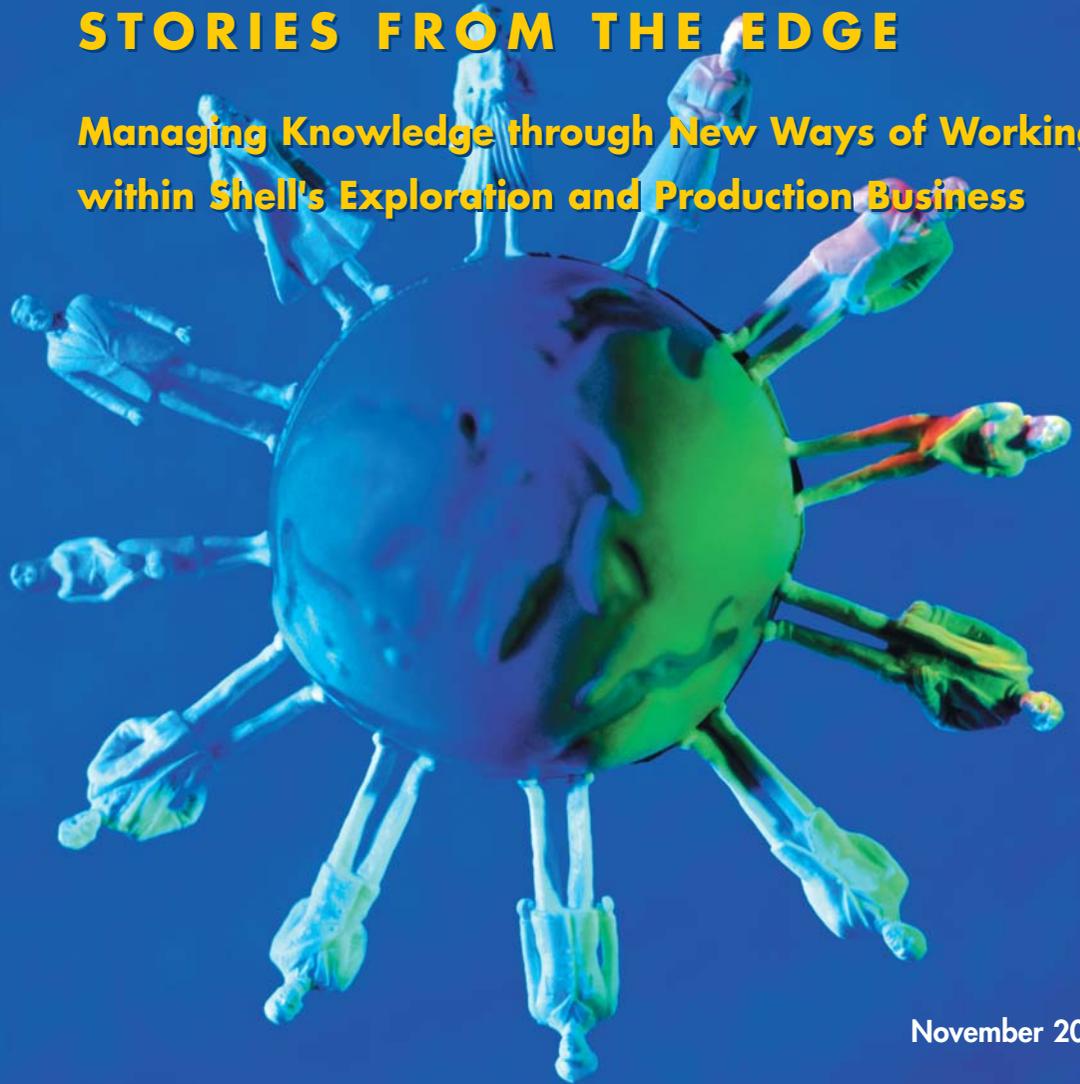


STORIES FROM THE EDGE

Managing Knowledge through New Ways of Working
within Shell's Exploration and Production Business



November 2001

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**Managing Knowledge through New Ways of Working
within Shell's Exploration and Production Business**

Shell International Exploration and Production

Organisational Performance and Learning

Published November 2001



FOREWORD

STORY-TELLING AND ITS ROLE IN MANAGING SHELL'S KNOWLEDGE

WHO WROTE THIS BOOKLET?

This booklet has been compiled by Shell International Exploration and Production's Organisational Performance and Learning (OPAL) team in Rijswijk, The Netherlands.

However its contributors come from Shell EP's network of operating units around the world – the people who make our business work.

Engineering professionals, scientists and managers working for Shell EP in many countries have written their own highly personal stories about managing knowledge in the oil and gas industry.

They speak about how they have been able to use information systems and organisational structures created by the company to capture and share knowledge and expertise.

Their stories deal with the practical implications of new ways of working, thinking and teaming across organisational, language and cultural boundaries in the Information Age.

WHY USE STORY-TELLING TO HELP MANAGE KNOWLEDGE?

Story-telling is gaining increasing acceptance as a means of communicating about business. The tradition of an oral narrative history that records and hands down learning, insight or collective revelation still thrives in social communities and Shell has found it particularly effective in helping change our business mindset and improve our knowledge practice.

The power of a good story well told can inspire innovation, personal challenge and professional breakthrough. Stories can encourage us to change, to think 'out of our boxes', to seek the aid of others in leveraging our own efforts.

For these reasons we have embraced story-telling within Shell Exploration and Production as a means of helping shape our knowledge-sharing culture.

WHAT'S IN THIS BOOKLET?

This is a booklet about one company's efforts to make knowledge and the people who possess it flow more easily around a global enterprise.

You can read about Shell EP's efforts to establish widespread computer-enabled global knowledge networks among its professional disciplines.

You can find out about how we have created an internal marketplace for what we call global consultancy, recognising the importance of people-based knowledge.

You can hear our centres of excellence describe their purpose, practices and successes in exploiting technical competences or regional specialities.

You can share Shell EP's journey as it seeks the prize of distributed teamworking by linking people with technology – to help eradicate the distance and time barriers inherent within a global company.

WHO IS THIS BOOKLET INTENDED FOR?

The Organisational Performance and Learning team prepared this booklet because we have found the story-telling approach increasingly useful and influential in helping us solve problems. We want to help others benefit from our experience with the technique.

The booklet has many possible audiences and it is hoped each can get something from it. We want graduates to view Shell as an exciting, vibrant and forward-thinking company for which to work. We want new recruits to learn about our efforts to keep them on the leading edge of exploration and production knowledge. We hope that stakeholders will value our efforts in maintaining our competitive edge through the deployment and distribution of our expertise.

Most of all we want our own staff to become aware of and grasp the means available to them for solving problems or realising opportunities within their company.

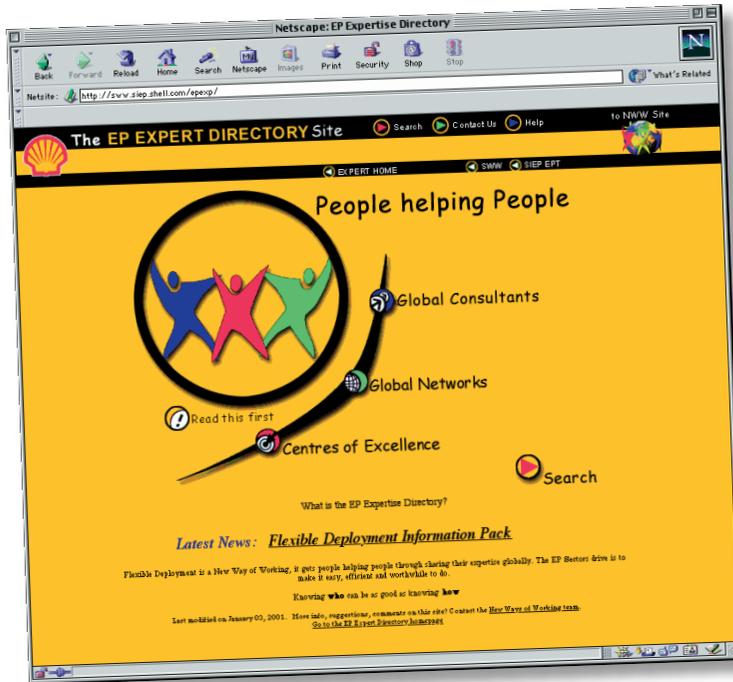
Shell believes that knowing who can be as good as knowing how.

From Cameroon, the UK, Gabon and Oman to Brunei, the USA, Brazil and the Netherlands, our staff are rapidly learning how to tap into the enormous knowledgebase Shell fosters, as it reaches for performance improvement in a fiercely competitive global business.

In their own words, these are some of their stories...

The Shell International Exploration and Production Organisational Performance and Learning team is grateful for the use of quotations taken from a 1999 paper prepared by Dave Snowden, Director of the Institute of Knowledge Management (Europe, Middle East and Africa), reproduced in this booklet with the author's kind permission.*

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Story *n., pl. –ries*

A narration of a chain of events told or written in prose or verse

Story telling is not an optional extra but an old skill in a new context. The new context is the emerging discipline of Knowledge Management that has arisen in response to the growing understanding that Intellectual Capital is the core asset of organisations and of society itself.

The old skill is the human capability to tell stories. Story telling has many purposes, entertainment, teaching, understanding and cultural bonding to name a few. Stories can also convey complex meanings across culture and language barriers, in a way that linguistic statements cannot.

It is early days in understanding the use of stories in a modern business; however the results are sufficiently good that we now know that there are major benefits to be achieved from the use of stories, and the development of story telling skills.

*Moreover, organisations are beginning to understand that story telling is not an optional extra. It is something that already exists as an integral part of defining what that organisation is.... **

GLOBAL NETWORKS

During the late 1990s, Shell's global exploration and production business saw a spontaneous explosion of computer-based knowledge networks, made possible by improving information technology and communications infrastructure.

But walking the fine line between exponential knowledge growth and the chaos of information overload requires some experienced people, a robust process and enabling technology that truly delivers. Working closely with facilitators and local network co-ordinators, the Organisational Performance and Learning team has been helping restructure, reinvigorate and expand our computer-based global networks.

Spawned by the Well Delivery Value Creation team with its highly successful network, our exploration and production professional communities are rapidly joining facilitated global networks covering the wells, surface and subsurface areas of our business.

In addition to these core technical networks more communities have sprung up in the past two years, such as commercial practice, procurement, benchmarking, competitive intelligence and knowledge-sharing.

The stories from our now-indispensable value-multiplying global networks are many and varied....



Pecten Cameroon's research revealed that other operators had achieved production gains by injecting demulsifier downhole in gas lifted wells, reducing viscosity in the production string and thereby increasing production. After a trial evaluation of their own, the company obtained a gain of 500 barrels per day or \$5 million per annum. The approach is being extended to 17 other wells with prospective gains of \$9 million per year.

Part of this success is due to global working through the Production Engineering Chemistry Network. A question was posed by Pecten Cameroon about the additional benefit of adding demulsifier to the gas lift gas manifold. Colin Davidson, a production chemist with Shell Malaysia at the time, shared his experience from Shell Gabon where the distributed approach had not been optimal. He recommended the use of individual injection points on the relevant wells. Further screening work has found that the technique is most effective in the 20-70% water cut range.

 *David Mason*
Pecten Cameroon Company, Doula

Shell Brasil sought assistance regarding fishing challenges (retrieving stuck or broken tools from a borehole) through the Wells Global Network. Best practices from Shell, notably Brunei Shell Petroleum and Petroleum

Development Oman, were presented to Petrobras as a potential partner. The information gained substantial credibility that will save in the order of \$1 million per well or \$7 million in total.

 *Peter Carson*
Shell Brasil, Rio de Janeiro

Brunei Shell Petroleum chose aluminium-sheathed 316L tubing over duplex or incoloy 825 for air cooler service, leading to savings of \$500,000 through shared knowledge from the experiences of NAM, WEL and Shell Expro.

Major repairs worth \$1.5 million, on well casings and electrical submersible pumps, were avoided by Petroleum Development Oman through knowledge-sharing from Shell Oil which confirmed that stray current corrosion can occur if the cathodic protection system was used.

 *Anton Sluijterman*
Petroleum Development Oman, Muscat

An estimated total of \$35 million was saved by question and answer focus alone in 1999 across the three major technical networks.

In the electrical engineering field, one Shell operating unit shared methods and results of their electrical cost savings efforts, worth \$400,000 per year, with the local utility company in negotiating rates for electrical peak avoidance. This practice was taken up at several locations with similar savings expected. An electrical systems idea from the same operating unit has reaped benefits of over \$30,000 per year at several other field units. Another idea for lightening protection is saving approximately \$100,000 per year by reducing lost production caused by electrical damage from storms.

In maintenance, the use of V-belt tension gauges and sheave guidelines was implemented at over 10 locations. A cost saving of \$140,000 per year resulted from sharing this maintenance practice.

What is a Story?

*It is important to remember that, like many aspects of our growing understanding of the role of knowledge in an organisation, the use of stories is a rediscovery of an important natural skill that has bound societies for centuries. Some cultures have never lost the skill. Teaching masters of the Dervishes use the stories of Mulla Nasrudin as a means for their pupils to gain wisdom. These Mulla Nasrudin stories can be traced throughout the Middle East from the early Middle Ages to the present day. **

WELLS GLOBAL NETWORK

Shell Offshore Inc's Deep Bo High Pressure High Temperature (HPHT) drilling team sought assistance when faced with a significant lost circulation challenge related to low pressure margins and higher pressures due to penetration of a high energy fault zone. A search of the Wells Global Network and LiveLink for best practices amongst Shell communities produced a potential solution. By applying a DiaSseal-M and Cement Squeeze technology which had previously proven to be successful in South Texas HPHT wells, a tremendous cost saving of \$1.5 million was made whilst still meeting well objectives.

 *Kazem Javanmardi*
Shell Exploration and Production Co.,
New Orleans

Question

from the Philippines

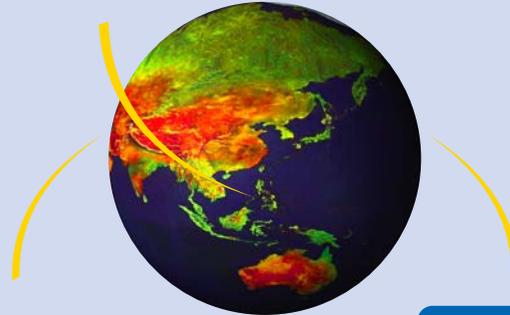
Any suggestion how to properly remove swarf and fines from our (Shell Philippines) well (we are milling up one 6-1/4"DC which was/is stuck at liner hanger). The well will be completed using horizontal Cameron tree in the first half of 2001.

Any suggestion what to do with regards to clean up:

- NOW, before we take the Blow Out Preventer off. (Wednesday 6/9/2000...)

- or LATER when tree is installed (danger of scoring seal areas when pulling tree bore protection sleeve)

Joan Horbeek, Shell Philippines



Answer 1

Wellbore Clean Up Option

We have had a lot of success in the last few months with the SPS well patroller system (inverted cup below screen section) in the subsea well engineering section in Expro. They also provide a number of other tools i.e. scrapers, magnets etc. which may or may not also be of use. Baker also have a 'super downhole' magnet which has also been used successfully here.

Neil Robertson, Shell Expro, UK

Answer 2

Cased hole cleaning

In addition to the SPS well patroller mentioned by Neil, we also had good success using Weatherford's venturi junk baskets, retrieving larger pieces of metallic junk (up to 6" long x 1" wide) following packer milling and liner cutting jobs.

Allan Garden, Shell Expro, UK

SUCCESS STORIES ABOUT USING THE WELLS GLOBAL NETWORK

Identifying and sharing success stories emerged while networking outside workshop sessions, therefore a specific session was run to capture some of them at a recent Shell EP event.

- *Money saved by running a whipstock rather than section milling.* Rohöl-Aufsuchung Aktien Gesellschaft (RAG) was planning to perform a section mill operation when a query with many replies on section milling vs. setting a whipstock was noticed in the Wells Global Network (WGN). Most of the answers recommended setting a whipstock. RAG didn't run whipstocks to sidetrack because of a bad experience with this five years ago. Armed with the WGN information, the plan was changed and not only was the paradigm broken, but it produced an estimated saving of 5% of the well cost.
- *Ran two shorter logging strings instead of one long one to prevent becoming stuck.* We had always run the platform express and sonic as a dual 30 metre long logging tool. These kept getting stuck in hole. Thanks to a detailed Brunei Shell Petroleum example in the WGN showing how it was preferable to run them as two separate strings, RAG has since changed their practice to running them separately and have not had a stuck tool for the last 12 months.
- *Facilitated fishing job.* Having got two packers stuck in hole, the best practice and reference material was downloaded from the WGN. The packers were successfully removed from the hole.

 *Adrian Chesters*
Rohöl-Aufsuchung AG, Gampfern

Contributed to a successful jarring operation to remove a pipe conveyed logging tool stuck near surface. The cable parted while pulling out of hole in a \$3 million horizontal well. The cable was snaked around the top of the tool string, thus blocking the string so it could not be moved up or down. Over the Christmas holiday after receiving an urgent e-mail, Wells Global Network resources contacted Kees Wijsman - now in Bangladesh - who was the jarring focal point at Rijswijk. By running jarring simulations and advising on the use of the equipment available, Kees was a key component in the successful operation to free the string. This was an example where the necessary resources were not available in the operating unit or even the country. Involving the Wells Global Network to make the link between technology and field operations helped salvage a well that was being considered for abandonment.

 *Paul Dumont*
Al Furat Petroleum Company, Damascus

Drilling in Depleted Reservoirs - Lateral Learning From Shell Oil. For Shell Expro to date, the challenge of drilling High Pressure High Temperature wells in depleted reservoirs has been considered a bridge too far. However, Expro recognise the huge potential value (estimated at over £100 million in next five years) that could be realised if such wells are made technically achievable.

The crux of the problem of drilling depleted reservoirs is that the producing formations are overlain by, and inter-bedded with, layers of shale. Shale, by definition has a very low porosity and permeability. In a virgin reservoir, the pressure in the shale layers ramps up to the same pressure as the sands that they are located within. However, in a depleted reservoir the pressure in the sand has dropped yet the shale retains its pressure due to its very low permeability.

As part of Shell Expro's investigation into ways of solving the depleted reservoir problem, a query was posted on the Wells Global Network. Later, a lateral learning 'scouting' mission was sent from Shell Expro to Houston. This trip was very successful, tapping in to the expertise and experience that decades of drilling depleted reservoirs in South Texas has generated. As a result of lateral learning from the operations guys in Houston as well as Shell Exploration and Production Technology Applications and

Research, Shell Expro has kicked off some studies that could potentially unlock the drilling in depleted reservoir problem and realise some of the huge savings that are to be made.

 *Christian George*
Shell Expro, UK

SUBSURFACE GLOBAL NETWORK

The Subsurface Knowledge Sharing Global Network (SKS) was formed to facilitate open discussions between subsurface people working in the different Shell locations. It provides an open discussion area where questions and answers can be posted. The SKS facilitates the exchange of knowledge including geophysics, geology, petrophysics, reservoir engineering and integration.

In 1999 the DnA team began to notice a drop in the number of Landmark licences maintained by operating units under the World Wide Master Agreement. The agreement included a clause which allowed for the transfer of the software between Shell Affiliates, incurring only a small administration fee. It was clear that operating units were unaware of this clause or did not see the possible benefits. In response, a software 'swap shop' was set up on the Subsurface Global Network to put people in touch with each other and stimulate interest through the existing network of users.

The software swap shop continues to prove highly successful. Operating units have swapped licences for Landmark and Schlumberger software resulting in savings of almost \$3 million since inception. The process is making Shell's use of existing licences much more effective whilst making additional licences available to operating units at a reasonable cost.

During 2001 the team plans to take advantage of the Global Contracting initiative and make use of the eSurplus website for software swaps. In addition, the formation of a Software Portfolio Management group within DnA, responsible for handling global exploration and production software contracts, means the team can ensure continued savings from their contracting strategy.

 *Bryn Hird*
Shell International E&P, Rijswijk

With the development of horizontal drilling, the next challenge to face was to install horizontal sand control completion where needed. Encouraged by the success of openhole horizontal gravel packs by Shell Offshore in the Gulf of Mexico, Brunei Shell Petroleum (BSP) has worked with Shell Exploration and Production Technology Applications and Research since (SEPTAR) early 1998 to refine this Shell-in-house technology for application in BSP's reservoirs.

Horizontal gravel packing requires the deposition of several alpha sand waves from the heel to the toe of the horizontal openhole to fill the annulus between the wire-wrapped screen and the openhole. This is followed by a beta sand wave which propagates from the toe to the heel of the openhole. Crucial to the design is the prediction of the alpha wave height and increase in fluid pressure as a function of the gravel size, gravel density, brine density, pump-in and return rates.

BSP contracted SEPTAR to run BSP-specific laboratory experiments to determine these relationships. As a result, a mathematical simulator was developed for the design and online monitoring of horizontal gravel packs. To date BSP holds the record of having the longest horizontal gravel pack in the Group. Due to their shallowness and low frac gradients, BSP horizontal gravel packs are especially challenging.

The benefits of this transfer of knowledge exceeded all expectations. To date, BSP has installed 17 horizontal gravel packs, the majority of which are in the very shallow south-east area of the Champion field. Of these, 12 had 100% hole coverage, four had partial coverage (30-60%) and one had placement failure due to a tool problem. All the horizontal gravel packs have produced at or above expectations, almost sand-free. By comparison, one horizontal openhole with screen-only completion and without gravel pack has already sanded up and shut in.

With the wide application of horizontal wells and the need for sand control, horizontal gravel packing will be a key technology for BSP. The implementation of this Gulf of Mexico technology is an example of the power of global networks in promoting best practices across the Shell Group, as several other operating units are now also evaluating the BSP results for application in similar environments.

 *Oddbjorn Skilbrei*
Brunei Shell Petroleum Co, Seria
or

 *Lau Hon Chung*
Brunei Shell Petroleum Co, Seria

As a key part of the Subsurface Global Network, the Opportunity Evaluation Consistency (OEC) network celebrated its first birthday at the end of 2000 with a review meeting of hub co-ordinators in Houston. One of Shell's first non-technical on-line communities, the OEC was created to provide a level playing field for judging risky and uncertain investment decisions, a pre-requisite for allocating exploration capital objectively that was felt to be missing.

Here is the story of one network's progress in leveraging others' efforts ...

A YEAR IN THE LIFE OF

A desire by a group of disgruntled explorers to 'deliver' might well sum up the key motivation behind the Opportunity Evaluation Consistency network's establishment in October 1999. A number of reviews and workshops confirmed for many that a better, more consistent decision-making process, coupled with an appreciation of the need to change global behaviours, was required with some urgency. Debate ensued among a small group of interested exploration and production professionals.

The sub-surface bias gave rise to the OEC team in the Subsurface Knowledge Sharing (SKS)

global network and the beginning of a busy year for all concerned. Virtual meetings involving hub-coordinators in the eastern and western hemispheres (usually teleconferences) are held every two-three weeks. These focal points have been instrumental in rallying their local peers to wholehearted participation.

No 'people' network can be effective without face-to-face contact on occasion, notwithstanding the technology interventions we have available to us. In April 2000 in New Orleans we reviewed the OEC progress thus far. Peer reviewers – the most respected knowledgeable members – had been accredited in advance and they were tasked with critically reviewing the ways in which subsurface risks and uncertainties were quantified ahead of the exploration capital allocation workshop. They also had the brief to judge how volume estimates were translated into value promises.

The consensus was that up to 70% of aspirations had been achieved by the OEC: the playing field was created and levelled to a degree but more work is needed in the field of estimating project value and the related commercial metrics. Also, drawing on the Shell Exploration and Production Co., an OEC 'cookbook' framework was created for capturing all the good peer review practices and learning in this community of practice.

In October in Houston at our first anniversary gathering, we reviewed our progress in penetrating organisational culture and practice with the consistent opportunity evaluation approach. Specific cross-learning examples include:

- Petroleum Development Oman's prospect risking matrix which was used in the Philippines
- Petroleum Development Oman built on Expro's experiences with the quantification of the undefined exploration potential
- Australia's confidence index is now routinely used by most and will in fact be a prerequisite in the next exploration capital allocation round

What has made the OEC special is the people, relentlessly pushing for the need to share knowledge and nurturing an environment where it is acceptable to abandon local beliefs, ask questions and provoke debate. There is also a clear connection between pride in technical excellence and an ability to secure capital from the global allocation process.

The establishment of the OEC network is a 'bottom-up' initiative that has now been complemented with the implementation of the 'Exploration in the Millennium' Focused Results Delivery (FRD) recommendations. In fact, the OEC community provided the FRD team with key data and continuous support.

Our true community spirit is primarily built on personal friendships and a genuine desire to help each other, sharing a sense of pride in our work and having fun! This community sense should lead to a situation where we always have the right people working on the right projects at the right time for the right reasons.

 *Laurens Gaarenstroom*
Shell E&P Int. Ventures, The Hague

SURFACE GLOBAL NETWORK

The Surface Global Network (SGN) provides members with an opportunity to tap into the enormous resources of the Shell "Surface" community both within the exploration and production sector and from Shell Global Solutions worldwide perspective. Currently over 2,800 Shell staff are registered. The SGN provides access to a wide range of common interest networks covering engineering, production and areas of special interest as well as the latest information on the technology development programme.

Wong Chee Yong of Shell Malaysia found information he had picked up on the SGN invaluable when confronted with a rotor lock-up during an M3 turbine change out. Chee Yong had previously read a number of entries on the SGN about lock-ups occurring during start-up attempts when the engine is still hot. Teams in Australia and the States who had experienced the same problems had posted possible solutions on the Network. When faced with the same situation during the M3 job, Chee Yong was fully prepared and knew how to react to resolve the problem.

"If I hadn't seen the previous entries on the SGN I would have taken a lot longer to resolve the problems and we might have needed to carry out a full inspection of the rotor system – a time consuming task requiring at least four technicians. Instead, I just kept calm and let the engine cool down further before restarting it."

 *Wong Chee Yong*
Sarawak Shell Berhad, Lutong

"Mainly I log on to learn and get exposure to what other people are doing and how they solve their problems. It's also a good way of working out who's who in the global community."

"You need to take a more active interest in the world around you...not just sit there with blinkers!"

SOME QUESTIONS POSTED BY PETROLEUM DEVELOPMENT OMAN IN 2000

Question 1

The Al Huwaisah production facilities export all the gross liquids. With the increase in water cut and depletion of the reservoir, local water injection is probably required. The costs of a local injection scheme would be minimal if the existing surge tanks could be converted to free water knock-out service. No experience exists in PDO with three-phase separation, without a gasboot or concentric tank design. Experience in Saudi Arabia (via Nederlandse Aardolie Maatschappij (NAM)) indicated that such conversions were carried out successfully.

Source of Information Obtained through SGN

Saudi Arabia (via NAM).

Impact this info had on PDO business

The development costs of the local water injection scheme were reduced by \$1 million.

What would have happened without this form of knowledge sharing

The development would be \$1 million more expensive.

Question 2

PDO has been asked to pre-qualify PPSC, Kuantan for the application of three-layer polyethylene and an internal flow coat for a potential 24 inch gas transmission pipeline in Oman.

PPSC claims it is familiar with Shell requirements for both of the above coating types and that it is in a position to provide them without any major qualifications.

Prior to discussing the issue with PPSC I'd be grateful for feedback on any actual experience with this yard for these coating types during the past three years.

Source of Information Obtained through SGN

Shell US. Advised of coating specialist who had recently visited coating plant.

Impact this info had on PDO business

Enabled verification of satisfactory condition of the plant thus supporting PDO approval.

What would have happened without this form of knowledge sharing

The approval process would have been longer and costs would have increased.

"In our discipline, we are exposed to many new products and technologies, where our operating unit does not have experience. Other operating units do, and feedback and experience can be shared rapidly."

"SGN has opened up a whole new circle of contacts in the Shell network which I can now use to help solve my problems and also help with my suggestions and information."

"Used effectively with active participation and high level of interest, it becomes a very powerful tool."

EXPLORATION & PRODUCTION COMMERCIAL NETWORK

The Exploration and Production Commercial Network (ECN) was set up in February 2000 for the 'commercial' communities within the exploration and production companies and Shell Gas and Power.

The key areas covered by the Network include finance, planning and economics, tax, treasury and strategic cost leadership. With a steady increase in its membership, the ECN is proving a highly successful medium for allowing members to connect globally, profit locally and develop personally.

A few active ECN members share some of the benefits that have resulted from their use of the Network in recent months...

"When I was a member of the exploration and production Capital Allocation and Planning team I used the ECN as an integral communications medium. All guidelines, spreadsheet tools and macros were published and version-managed in the ECN. Our website also linked to those same documents in the ECN as the single point reference to the latest official version. This saved us answering a lot of individual support questions and resulted in reduced e-mail charges as we didn't need to e-mail large files around the world. I hope that more staff will pose their questions via the ECN rather than via e-mail so that the whole community can learn from the answers.

The ECN is a very powerful medium to reach a global audience. I consistently use it to manage key reference documents and disseminate these to a global audience, often in combination with traditional websites.

Recently the EP Planning, Portfolio and Economics team upgraded the Economics Workbench (EWB) software and manual and made them available via the ECN. In less than three months more than 150 staff have visited the webpage and many of them have downloaded the upgrades. It is no longer necessary to produce CD-ROMs or diskettes and distribute them to all the EWB users in the world."

Sven Kramer, EP Planning, Portfolio and Economics

"Being relatively new to the Shell economists' community I find the exploration and production Commercial Network very useful, mainly for orientation purposes. I believe that the value of networking is always a long term investment – one day the story you read or the person you have heard about via a network might save you a lot of time, trouble and money."

Monika Hausenblas, Shell International Exploration and Production

"Thanks to the knowledge sharing networks (mainly Competitive Intelligence, but also ECN and Subsurface Network) we have been able to conclude Shell International Exploration and Production-wide corporate deals for Wood Mackenzie and IHSE Energy data at prices that properly reflect the value to Shell. Being able to communicate directly with the relevant community has prevented us from having to pay prices primarily reflecting the vendors' aspirations."

Con Goedman, CIAD & head EPB Data Management

"I think it is a useful tool to keep abreast of developments in the centre. I regularly distribute information from ECN to my staff and others here in the company. I find that very useful."

Peter Verschuren, Shell Venezuela

"Last year when I was Finance Manager of Shell Egypt, I posted a query on the ECN regarding Recovery of Evolutionary Technology from a competitor. The responses through the ECN were very quick and it was certainly a very efficient way of finding out what other operating units were doing."

*Simon Smith,
Shell International Finance and Resourcing*

For the Shell Group as a whole, the Exploration and Production Commercial Network

- Allows more optimum allocation of resources without physical relocation
- Supports a learning organisation by practically developing staff competencies

For the operating units, the ECN

- Permits quicker resolution of operating unit problems by preventing "re-invention of the wheel"
- Provides access to expertise beyond current establishment

For the finance and business development units in The Hague, the ECN

- Enables access to know-how and experience in the operating units
- Allows better focusing of systems development

For the individuals, the ECN

- Enables personal development
- Provides an enhanced network
- Gains recognition from peers

PROCUREMENT GLOBAL NETWORK

The Procurement Global Network (PGN) is the first stop for all procurement professionals and those interested in procurement issues. It enables members to ask questions, find answers, share information and save time and money through leveraging the combined procurement experience in Shell EP.

Shell recently increased its shareholding in Sakhalin Energy Investment Company Ltd. (SEIC) from 25% to 55% and Shell now provides most of the seconded staff. As part of the process, the separate contracts and procurement groups were combined. In an effort not to re-invent the wheel, advice was sought from the Procurement Global Network on a range of subjects: setting up remote location tender boards, balancing local content, availability of 30 inch casing and building contracts control courses for contract holders.

In each case the responses received from around the Shell Group were quick, informative and contained clear practical advice and experience gleaned by individuals who had faced similar issues around the world. Whilst it is hard to quantify the benefits in financial terms, the advice prevented re-invention, offered some differing solutions and enabled a much quicker turnaround and production of guidelines and advice to SEIC.

One additional spin-off of asking the questions was to prompt other contracting and procurement staff in the Group to consider the issues and we have opened a dialogue with other close-by operating units in the areas of possible shared training provision.

 *Nick Binks*
Sakhalin Energy

Question

from Rijswijk

We have a Russian content requirement in our Production Sharing Agreement (PSA). Does anyone have a similar requirement to capture local content (contracts awarded to local companies, locally procured materials, locals employed etc) and if so how is it done?

Nick Binks, Sakhalin Energy

Answer 2

from the Hague

Try the system called Omnicom. I recently reviewed this package in Norway. Whilst it is not quite finished, it looked like a very polished package and extremely flexible. Fields such as local content could be added to the base set-up in less than a minute.

Geoff Bird, Shell Int. E&P, The Hague



Answer 1

SPDC experience from Houston

SPDC (Shell Nigeria) have a system for capturing local content that requires mandatory completion of a section on the tender board submission. SPDC also have a detailed policy and department which deals with Community issues including local content.

*Campbell Wyper,
Shell Deepwater Services, Houston*

BENCHMARKING GLOBAL NETWORK

The Benchmarking Global Network (BGN) was formally launched in July 2000. In January 2001, approximately six months later, some 170 members representing 30 operating units had joined the Network. Benchmarking is not a discipline as such and, as a result, the size of its community is not expected to reach into the thousands as seen in other discipline networks. However, practitioners and focal points in operating units have become aware that benchmarking is one of the key enablers of Strategic Cost Leadership (SCL) and, in response to this, the BGN offers a platform on which benchmarking approaches, planning, experience and results can be shared.

One of the key outcomes of the BGN is the assembling of the global exploration and production benchmarking activity inventory for 1999 and 2000. The created matrix provides answers to questions on benchmarking such as:

- who does what, where and how?
- which benchmark partners do we compare ourselves with and which consultancy firms are used?
- what are the results, opportunity gaps in financial terms, learnings and successful practices?
- who can I contact to find out more about a particular benchmark study, etc?

The Benchmarking Global Network assists in the transfer of experience from advanced to other less advanced operating units. The results of the recent Business Plan indicate that a potential performance gap of some \$340 million has been identified from our EP global benchmark studies completed in 2000; some \$200 million of the 340 are reported as being closed with the implementation of some reported 60 better business practices. The story does not stop here: the remaining \$140 million provide the additional challenge and also a strong focus for additional and realisable performance improvement.

 Jacques Ortet
EP Global Benchmarking Coordinator

Some operating unit representatives offer feedback on how their use of the Benchmarking Network has benefited their performance...

"The participation of operating units in the Andersen Benchmark General and Administration (G&A) study (overhead cost benchmark that highlighted sizeable opportunity gaps) was greatly facilitated by the presence of the BGN - not the electronic network, but the people network built up around it."

Steve Kaiser, Shell E&P Co.

"The BGN gets me connected with fellow Shell staff in the same discipline doing similar jobs. It facilitates the sharing of lessons learnt, and helps avoid repeating the same mistakes or re-inventing the wheel. Having said that, I would like to see more completed benchmarking projects with the implementation of follow-up plans which yield tangible gains to be shared on the BGN."

Yu Teck Chuong, Shell Deepwater Services

"Whilst still at embryonic stage, the global benchmarking initiative we have been working on, would not have come this far without the BGN and the networks I have been able to build as a result. It is a prime example of the potential power of the BGN."

Peter Orbell, Shell Expro

Post

from New Orleans

We have just completed a benchmarking study on deepwater projects. The analysis compares the key parameters of Shell deepwater projects with that of over companies in IPA database.

The key projects metrics are:
- total project cost vs sanctioning year
- cost per recoverable reserves
- cost per design throughput

- schedule durations
- schedule vs design throughput

Please email me if you are interested in the results.
Yu Teck Chuong, Shell E&P Co., USA

Answer 1

from Aberdeen

Yes, we would be interested in sharing your results into our subsea facilities.
Guus Driessen, Shell Expro, UK

Answer 2

from Warri

Can I have a copy of your deepwater benchmarking results (the subject of discussion item no. 108 of the BGN). I'd like to use it to leverage project level benchmarking for SPDC's projects. I'm aware that the results per se are relevant for deepwater projects only but I'd like to use the results to illustrate the power of benchmarking process.

Gopal Papchan,
Shell Petroleum Development, Nigeria

Answer 3

from Calgary

I have just started in the benchmarking role and would appreciate a copy of your results

Noreen Conway, Shell Canada Limited

Answer 4

from Perth

Yes we would be interested in sharing your results given our potential expansion into deepwater facilities. Please refer to my separate response via the email address option.

Gary Keenan, Woodside Energy Limited

Answer 8

from Rijswijk

Just got it in the email today, many thanks for that. The format used by IPA is clear, quite simple to follow and above all the results of SDS are of most interest.

I would like to suggest that all those involved or about to get involved in deep water, producing yet or not, have a look at this report...

Hope the other parties who ask for this report received it too.
Jacques Ortet, Shell E&P, The Netherlands

Answer 7

from Muscat

We will be very much interested in the results, as we have got a deep water concession.

Mahmoud El Khamissy,
Petroleum Development Oman

Answer 6

from Lutong

Since we are going to deep water, yes we are interested in the results.

Mohd Shah Rahani, Sarawak Shell Berhad

Answer 5

from Perth

Received copy of your IPA report in the mail today. Consider information very pertinent to some of our projects in assess and select phases now.

Information on schedule durations most useful. Thanks for the opportunity to share in your work.

Gary Keenan, Woodside Energy Limited



COMPETITIVE INTELLIGENCE GLOBAL NETWORK

Industry experience indicates that 80% of the information needed to create intelligence is already present somewhere in an organisation. If the information is out there then it only needs the formation of a well-disciplined network to gather it in.

In order to share competitive intelligence effectively across the Group and exchange best practices, a Competitive Intelligence Global Network (CIGN) was set up early last year. The Network now has over 1,100 members throughout Shell.

The vision of an active CI community in Shell Technology Exploration and Production and EP consists of CI professionals and other interested parties actively seeking out and creating actionable intelligence. The CIGN supports this process by providing a forum where information can be exchanged and discussed. Over time, sub-networks have developed and become a forum for competitive technical intelligence. These sub-networks help us deal with specific intelligence topics.

Some of the members of the CIGN share their experiences of the Network since its inception.

"I put a question into the network to find out who in Shell was negotiating deals with TotalFinaElf. I received approx. 30 replies of which seven were filed in CIGN (the rest by email and phone). 30% of the replies helped me answer the task at hand and the other answers helped me build up a better understanding of the contacts between the two companies. The CIGN proved to be an extremely efficient way to get hold of the information needed."

Jan Manohoran, Shell Int. E&P

"I posted a question about a competitor development in Egypt in CIGN. Receiving information from other CIGN members saved me a great deal of time: an initial investment of 15 minutes turned into time savings of at least five hours. I also established valuable contacts through the query and hope to be able to explore these in the future."

Hans Nijkamp, Shell Expro

"I was looking for information about a particular Gas Journal and decided to post a query on the CIGN. The responses I received helped me tremendously with phone calls and emails coming from various sources. I would estimate that the additional information I gained through the responses saved me at least three working days."

Rosemary Cooper-Clark, Shell Financial Services

"When I used the CIGN to source information about the potential Amerada Hess - Lasmo take over, a response from Ceri Powell, Shell International Exploration and Production, saved two days of my working time. This time would otherwise have been spent on gathering information and the related analysis."

Shaun McCarthy, Shell Corporate Centre

"The benefit of using the CIGN in this case was spotting people who know something about the subject that you wouldn't have asked normally. It adds another channel to the 'normal' way of asking regional business advisors about what is happening in their country. To be honest, I was quite surprised by the multitude and diversity of replies. Very insightful and useful for making connections."

Elke Mueller, Shell Int. E&P

"I am a business analyst working for Shell Hydrogen. Today's industrial gas companies considered to have the best capabilities in manufacturing, transporting, and delivering merchant hydrogen are Air Products, L'Air Liquide, Praxair, Linde. I was assigned a research project where I needed to find out quite quickly what the Group's strategic relationships with these companies were. I posted the question on the CIGN and got a number of leads. The question was further posted by the forum moderator on the Global Procurement Network which again generated a huge response which helped a lot in building the complete picture and assessing the potential implications of partnering with one company as opposed to the others."

Ioana Chiru, Shell Oil Products Company LLC

KNOWLEDGE SHARING NETWORK

The Knowledge-Sharing Network (KSN) is about how we globally network and its growth serves the call for sharing our best practices. Like our other global networks it serves many people outside the exploration and production sector, keen to learn how EP has become so highly regarded in the outside world for the quality and value generation of its knowledge sharing. Using the KSN we aim to share our improvements with each other to generate more value and cement our reputation in this area.

"From a personal perspective I have found the Knowledge Sharing Network to be very helpful with lots of relevant and timely material and some good contacts. It would be difficult to put a savings value on this information but I can confidently say it has saved me a significant amount of work and provided a lot of very useful and relevant background information."

Paul O'Neill, Business Analyst, Shell Todd Oil Services

Brunei Shell Petroleum was exploring the feasibility of implementing a corporate wide storage solution for data. After having done some initial work in house, they requested further information and confirmation of their approach by posting a query on the KSN (entitled “Urgent request for Info – Corporate storage options”). This resulted amongst others in a reply from Petroleum Development Oman, containing a report with the outcome of the work they had done in the same field.

“The technical direction taken by BSP was confirmed by the several responses received and of course, it greatly helped to reassure and strengthen the decision made. The additional perspective it added was the global operating unit’s experience and this completes the total analysis picture.

If we had to do a comprehensive analysis like some operating units have done, we would have to spend at least one manmonth of effort. We are extremely glad that we can save this effort.”



2

GLOBAL CONSULTANCY

While much can be done in the field of knowledge management through the systematic capture of corporate wisdom in online systems, expertise is often inherently resident in the individual. Recognising this, Shell EP has set about creating an internal market place for its best practitioners in the disciplines required for day-to-day operations.

Over the past two years many individuals from our 220-strong pool of Global Consultants have provided expertise beyond their operating units, delivering their professional time on an as-needed basis. They are sourced by a prospective customer through a specially-created knowledge 'portal' called the Expertise Directory.

Originally devised as a means of providing specialist inter-operating unit services of short duration by individuals or teams, global consultancy has proved an effective, personal and therefore highly tangible area of Shell's new ways of working.

The immense wealth of expertise resident in our best people, coupled with the means of sharing, has opened up a world of opportunities to raise standards and operational performance of the businesses.

As the following stories demonstrate, Shell EP global consultants can get as much from the experience as they give...



"Over the past six months I have made contributions to the Iran project, undertaken work for Argentina and carried out email correspondence with Pakistan, Gabon and New Zealand. I cannot claim that it all originated from the Global Consultants' forum. It does, however, demonstrate the requirement (especially for the New Business Development projects) for specific expertise.

The global networking approach through e-mail has, in my case, been successful - although it is through personal contacts. Previously I have assisted with problems in China, Australia, Russia and in the Caspian Sea and was heavily involved in the drilling planning for the Peru project

Here in Petroleum Development Oman we presently have a centre of expertise in drilling fluids, cementing, and stimulation that could be exploited more effectively under a different organisational structure. The Shell Group is deficient in this expertise - hence the involvement in the projects listed above."

*Eddie Stevenson
Petroleum Development Oman*

Global Consultancy - Message

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Reply Reply to All Forward

From: Lopez-Lopez, Jos
To: EPT-AGI Group
Cc:
Subject: Global Consultancy

I joined the global consultancy network during early '99. Since late '97 I had been working in the New Opportunity Evaluation team, where we evaluated new business opportunities from around the globe. These evaluations were done either in Rijswijk, where our group resides, or off-site on location.

Forming part of the global consultancy network was a natural way to continue providing technical services within the context of EPT-AGI.

Some of my key off-site assignments during 2000 included:

Venezuela LNG evaluation, where, together with other EPT-AGI colleagues, I was involved in the optimisation of FDPs for a set of old gas discoveries off the northern coast of Venezuela. Our work led to the start of negotiations with previous partners, including Petr leos de Venezuela SA, and the undertaking of a more detailed evaluation with a view to formalising a new Joint Venture.

China New Business Opportunities where I was part of a number of teams charged with the evaluation and valuation of Sinopec and CNOOC assets. I was working alongside excellent colleagues, many of whom were also Global Consultants. Based in Beijing, the work we undertook resulted in a number of strategic alliances with these companies, providing Shell China with a strong foundation on which to build.

Australia Vincent Appraisal where, together with Bob Hite (RE) I participated in a Woodside organised workshop in Perth and contributed to the formulation of the Vincent field's appraisal strategy and best practices.

As a Global Consultant you are recognised and given merit for the skills and knowledge you build up in your own area of expertise - to be given opportunities such as these not only increases your knowledge further, it also enables you to share your skills and strengths with fellow colleagues.

I have every belief that the work of global consultants will continue to grow, and I am looking forward to undertaking further assignments to which I feel I could make a valuable contribution. I would also recommend the role to others who may have considered registering.

Jos  A. L pez-L pez, Shell Int. E&P

"I think global consulting is a great concept. It adds a new dimension to the job. It is worth noting though that with the temporary drop in experience levels in a number of operating units, the remaining experts get more and more stretched if they want to support other operating units as well. Although a commitment is being made by the line to set aside time for global consulting, this work is often done in the global consultant's private time. This aspect should be considered in the development of an otherwise very good concept."

*Klaus K Mueller
Petroleum Development Oman*

"I have been contacted on several occasions since being listed in the Expertise Directory. Requests came from far afield including; Turkmenistan, where I was involved in a well performance and integrity review; Oman where I participated in an electrical submersible pump implementation audit and Argentina, where I took part in a peer review of a non-operated asset. I also received a request from Iran for general production engineering advice. The directory is clearly a good way of formalising what was previously an old boys' network."

*John Rusz
Shell Exploration (China) Ltd*

Global Consultancy - Message

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Reply Reply to All Forward Print Attachments Undo Redo Help

From: Fowler, Peter
To: EPT-HO
Cc:
Subject: Global Consultancy

A chance for change

In April 2000, in my role as a global consultant, I led a team to Brunei Shell Petroleum (BSP) for five days to review proposals for the upgrade and modification of two compression facilities as part of the Ampa Fairley Phase II Project. The review team was pulled in to make a recommendation on the compression modules on Ampa 9 and Fairley 4.

Our initial review recommended the installation of new compression modules on Ampa 9 (which is 10 years older than Fairley 4) and an upgrade of the units on Fairley 4. This was also the BSP project team's recommendation but required more capex than had been requested from BSP management. This option would have met the basic project objectives but BSP management also asked us whether the existing compressor packages could be operated for a further 20 or so years. We concluded that this was possible but would have significant penalties to the operational objectives of the project - expected reductions in Opex and manning levels would not be met, availability could not be maintained or improved and Health, Safety and Environment risks could not be reduced to the desired extent.

Time to rethink

Following the review, the BSP Project team approached BSP management and advised a re-evaluation of the project scope and parameters. The advantages of installing new compressors, including long-term flexibility and the ability to meet operational objectives, were realised and as a result of this rethink two new larger compression modules were specified for Ampa 9.

Without the efforts of the review team, BSP management may not have approved this change to the project which, despite increasing the capital budget for the new equipment, will most likely reduce the life-cycle cost over the next 20 years.

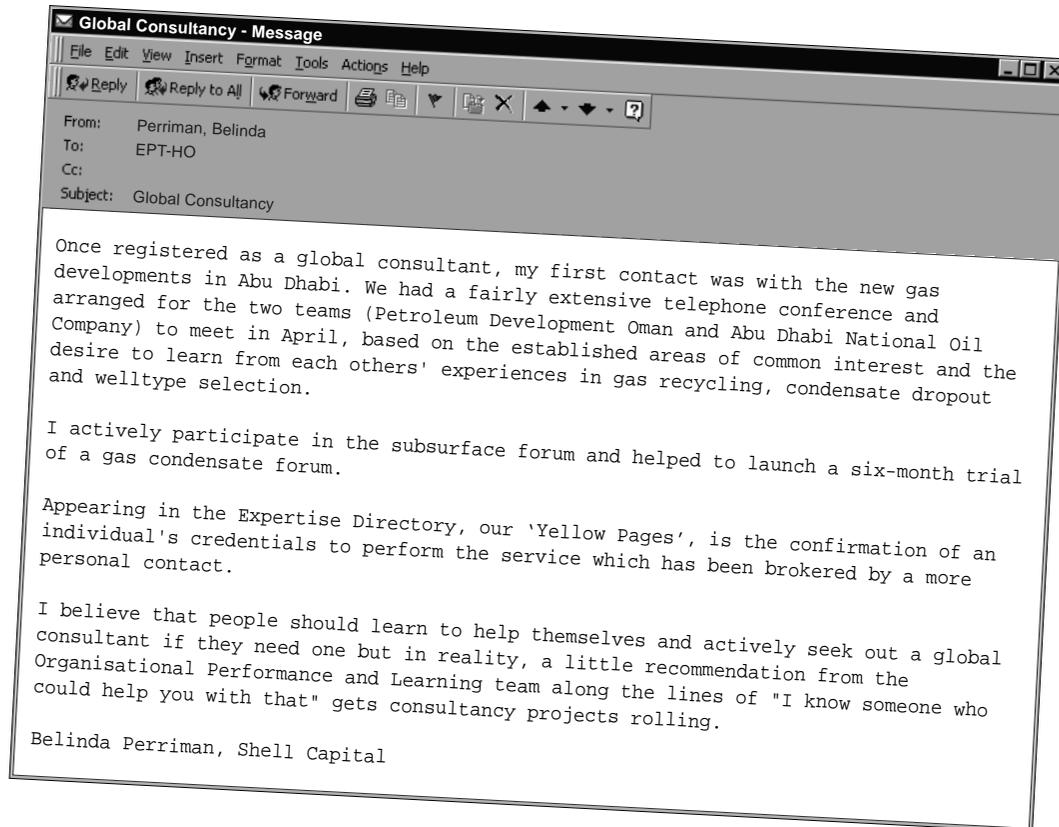
The review took approximately 15 man days of my time, including preparation, the time in Brunei and reporting. Three other Woodside staff engineers were involved in the review, each spending about 10 man days.

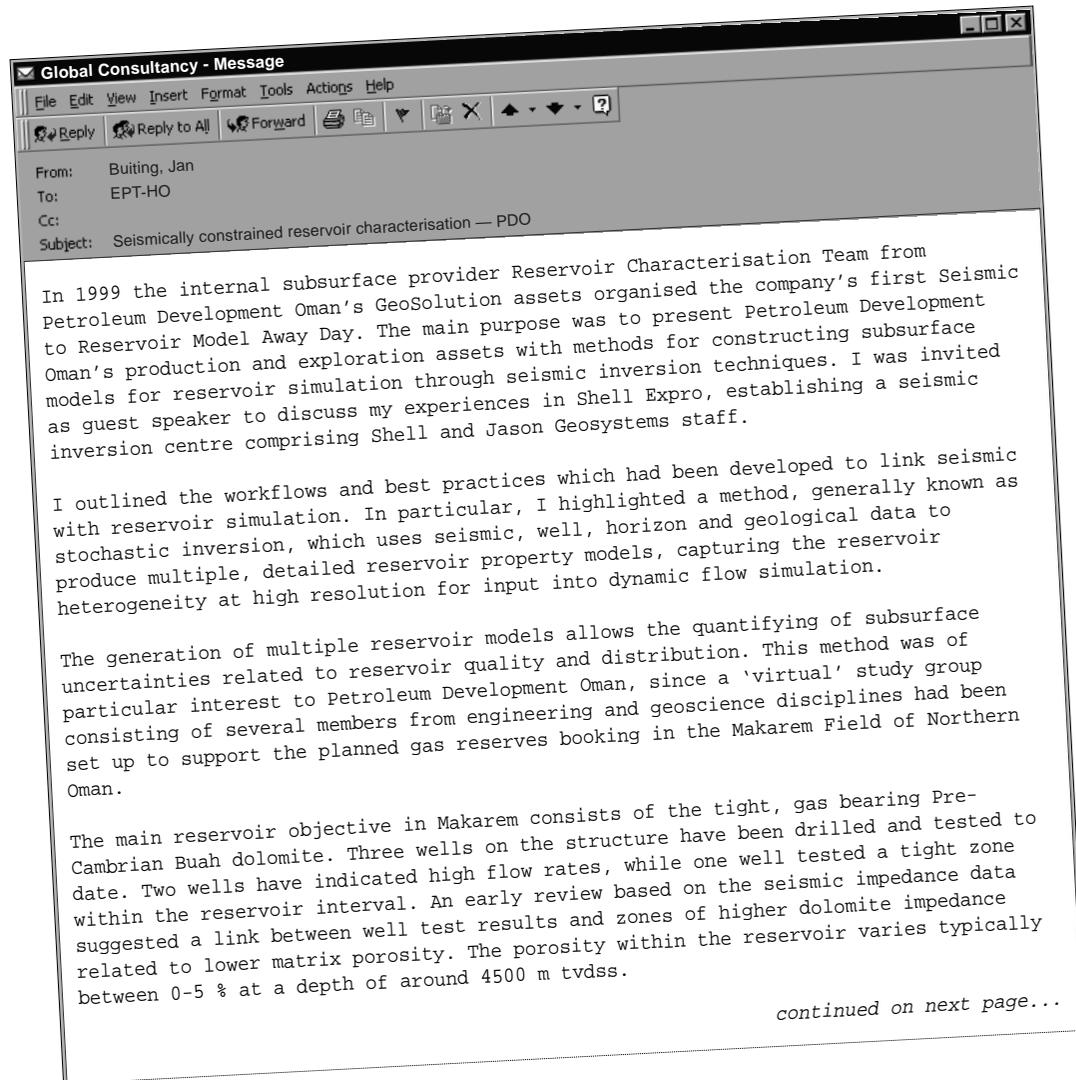
Peter Fowler, Woodside Energy Ltd (Australia)

"Since being listed in the Expertise Directory I have acted as an intermediate for identifying production chemical specialists to Brunei Shell Petroleum and the Iran offshore team. I contributed to the formulation of ITT documents and was invited to the subsequent tender evaluation in Dubai in May 2000. I contributed to the Nigeria offshore team helping out on a drilling fluid tendering exercise and also contributed to Producing the Limit (PtL) and Drilling the Limit (DtL) exercises in Petroleum Development Oman."

"Members of the Shell Productivity Improvement Network team, Bart van der Linden and Hans van den Berg, spent several weeks in Brunei Shell Petroleum to resolve the continuing dehydration problem with the export crude. Their input focused mainly on implementing recommendations made by several specialist teams from Shell Global Solutions. Their contribution was greatly valued as they provided production chemistry skills which do not reside within Shell Global Solutions."

*Manfred Eigner
Shell Int. E&P*





...continued from previous page

On my way back to Shell Petroleum Development Company, I visited Dubai to commission a free stochastic inversion pilot project for Petroleum Development Oman. The successful pilot used data initially provided by PDO from one of its Shuaiba carbonate fields. Subsequently, it was decided to use Jason in Dubai to provide the matrix porosity models for the Buah and a secondary shallower clastic reservoir level for the Makarem reserves booking.

The project was carried out in Petroleum Development Oman/Dubai and was completed by the end of 1999. During 2000 other members of the study team acquired further crucial data from well testing and cap curve measurements. All data was then integrated together with a fracture model into the dynamic reservoir simulator leading to a successful booking of 1 Tcf of gas at the end of 2000.

Meanwhile, the Reservoir Characterisation Team has adapted an inversion-centre model similar to Expro, albeit modified for Petroleum Development Oman's need. Special emphasis has been put on the fact that the team should consist mainly of Petroleum Development Oman staff assisted by Shell and third party service providers as required to build up its own experience base over time.

The team has since then successfully applied the workflows which I outlined to other production and exploration objectives.

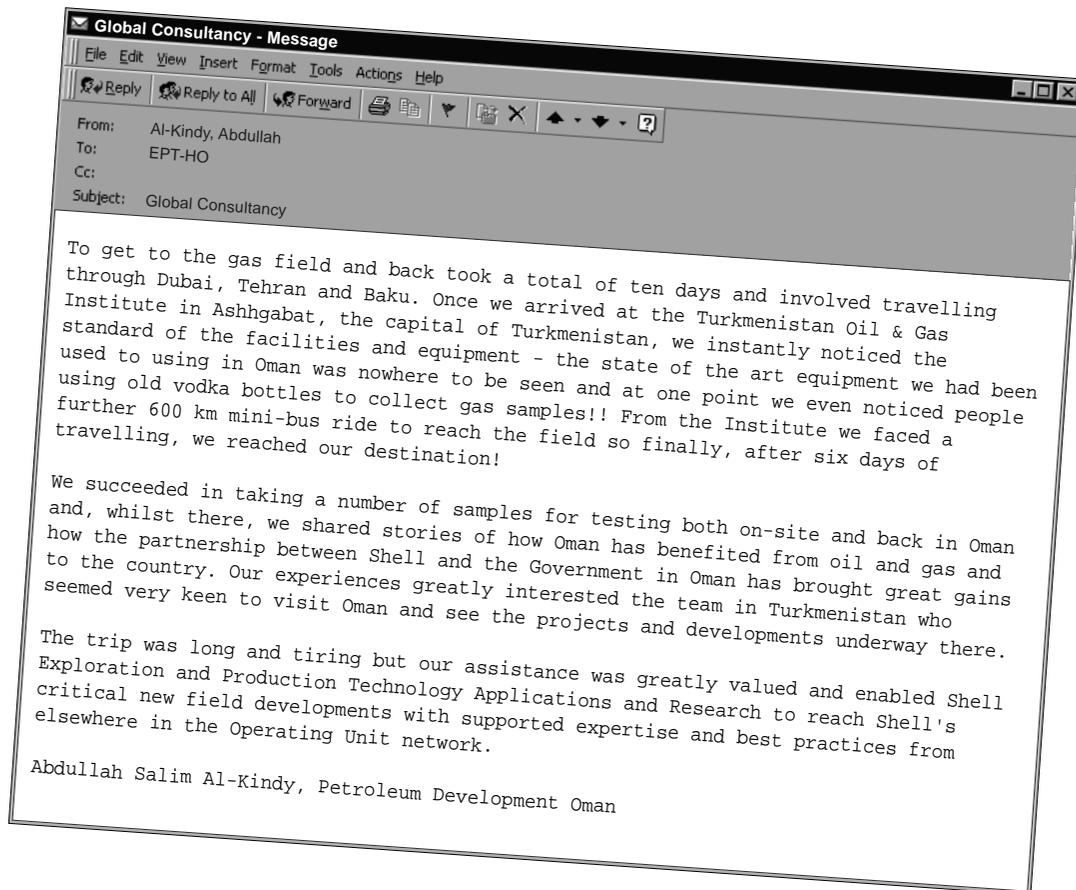
Jan Buiting, Shell Nigeria E&P Co. Ltd

"Jan's input as a global consultant has not only contributed to a one-off substantial gas reserves booking, but has also helped to formulate the identity of Petroleum Development Oman's Reservoir Characterisation Team"

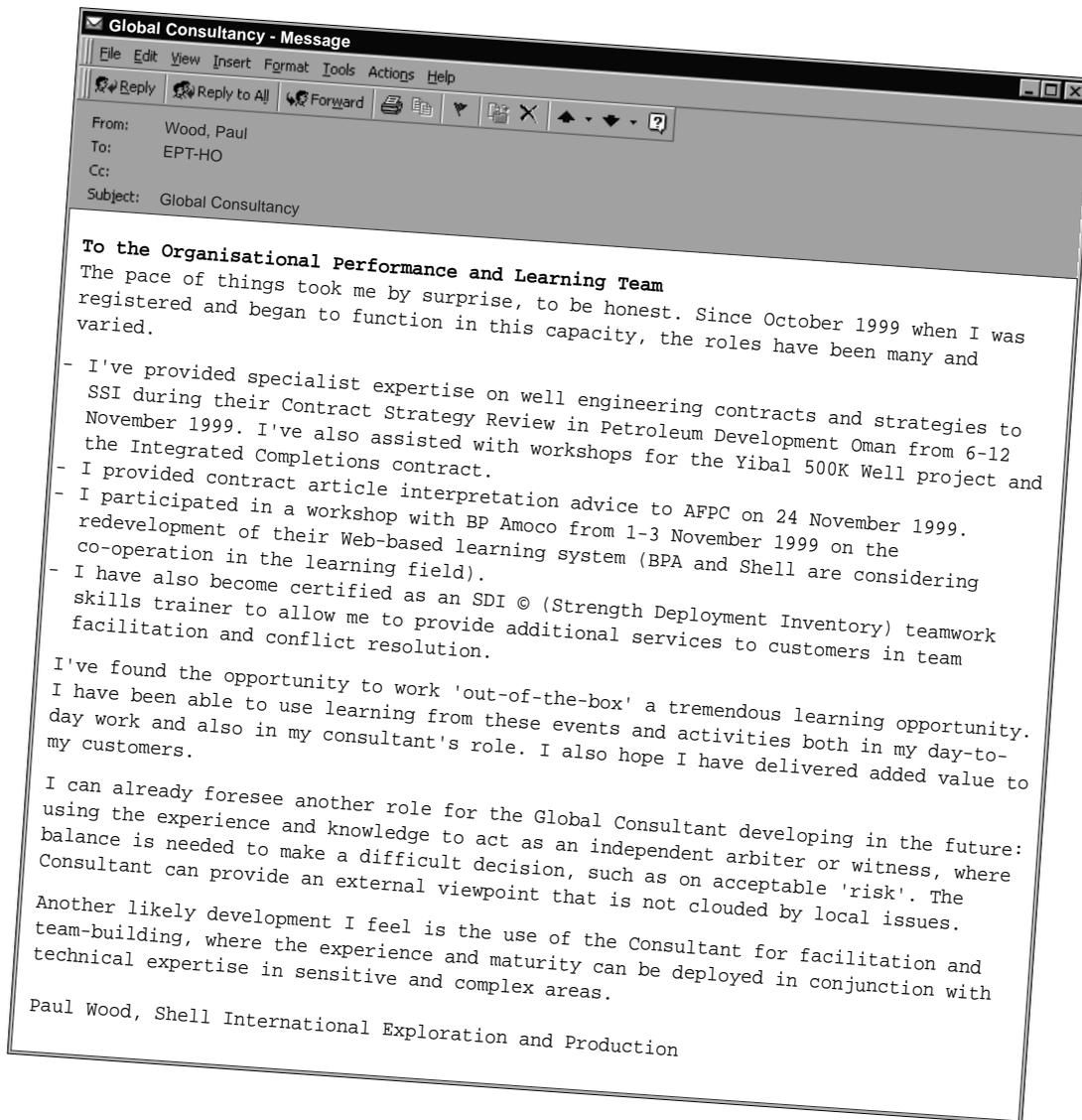
Roland Muggli, Petroleum Development Oman

Early in 2000, Ali Al-Saidi and Abdullah Al-Kindi from Petroleum Development Oman were contacted by Shell Exploration and Production Technology Applications and Research and were asked to travel to Turkmenistan to carry out gas, glycol and water analysis at the Malay gas field.

Their account of the journey and the conditions they encountered whilst there prove that global consultants need to be prepared to face all sorts of challenges!



*One aspect of the growth of virtual communities, both internally to companies and as part of the growth of e-business, is the re-emergence of many of the characteristics of the oral cultures that preceded the birth of scientific rationalism, itself enabled by the invention of a printing press. Electronic communication is more conversational, more immediate and more direct. In this context it is not surprising that the story telling skills of previous oral traditions are coming into their own in the new age of uncertainty that we are now entering. The capability of an organisation to create its own stories, and through that creation to define its culture and place within its chosen environment is key. **



GLOBAL CONSULTANCY IN PRODUCTION CHEMISTRY...

Over many years a group of twenty highly specialised production chemistry staff in Shell EP have accumulated unique experience in critical areas ranging from well engineering to production operations.

Available for the provision of consultancy and advice since October 1999 and supported by the Production Engineering Chemistry Network (PECNet), their active assignments have been varied and challenging...

FROM GABON TO BRUNEI...

Gerrit Aberson is one of the global consultants within production chemistry and on Wednesday afternoon November 10th 1999 he got a request to travel to Brunei as soon as possible to assist in solving a dehydration problem over there. Shell Gabon management quickly agreed and within 24 hours of the first call Gerrit was on his way. He explains the nature of the problem:

Brunei Shell indeed had a very serious problem. They have recently doubled the production in one of their offshore fields but they can not completely dehydrate this crude in their normal production facilities. They do have special emulsion treatment facilities downstream of their production unit but those have a limited capacity.

Over the past six months they have produced twice as much emulsion as they can treat and, due to a bacterial problem, their emulsions are now nearly untreatable, even in the special units. They did nothing fundamentally wrong but there were a lot of old habits and some complacency, which had grown with time and which under the new production levels were no longer sustainable.

My first goal was to reduce the amount of emulsion coming from offshore and to eliminate the bacterial problem. The latter had nearly been solved by the local chemists when I arrived so I could firstly concentrate on reducing the amount of emulsion which was produced in the field. A number of the recent improvements we made in Rabi could be applied in Brunei as well (group knowledge sharing through virtual teaming) and one more technical change in their dehydration set up will certainly bring the emulsion levels back to well within the treatment capacity.

The emulsions which are currently stored in the terminal are certainly quite difficult but a step wise approach and the use of some centrifuges which are normally used on drilling rigs will also solve this.

None of my proposals was really spectacular or outrageously difficult but at the time Brunei Shell did not have the specialist know how which was required to go back to basics and dream up these solutions.

Brunei Shell Petroleum had already incurred demurrage penalties due to tanker delays of up to Brunei \$1 million. We received a lot of hands-on help to get to the root of the problems - one guy for a somewhat longer period is better than two for a short period. We really appreciated the detailed knowledge and experience of the specialists and the fast response to our calls. Of course it cost us some money, but I would do it again – absolutely !

Thomas Helmer

 *Gerrit Aberson
Shell Iran Offshore Ltd, Dubai*

MUD TENDER SPECIALIST FROM SHELL EXPRO....

A specialist on the mud & cement tendering process for a Middle East offshore project was required at short notice to help complete tendering documents before the end of 1999.

Knowing that Shell Expro and Nederlandse Aardolie Maatschappij have been involved in setting up new ways of procurement of mud and cement chemicals under their Big Leverage Club initiative, an available mud tender specialist was identified within Production Chemistry in Aberdeen and was released immediately.

Since any delay in completing the tender documents could have seriously impacted the meeting of deadlines for the start of projects in the field, the value of this Production Chemistry consultancy was significant.

 *Manfred Eigner
Shell International Exploration and
Production*





3

CENTRES OF EXCELLENCE

Shell EP's Centres of Excellence (CoEs) are formally recognised communities of specialist EP expertise, drawn from one or more locations around the global organisation. Their function and purpose is to consolidate, augment and make their unique services widely available throughout our global business. The Organisational Performance and Learning team has worked with the CoEs to align their services with operating units, overcoming competitive dynamics and helping to market their consultancy services to any individual or team with a need.

Shell EP's current CoEs include:

- *High Pressure/High Temperature Drilling*
- *Pre-Stack Depth Migration*
- *Maintenance Strategy and Reliability Engineering*
- *Offshore Structures Engineering*
- *Underwater Activity Services*
- *Shell Hazard and Risk Exchange (SHARE)*
- *Subsidence Compaction*
- *Land Seismic Acquisition and Processing of Desert Areas*
- *Petroleum Systems Modelling*
- *Groupware IT*
- *Geographical Information Systems*

They also have stories to tell...



HIGH PRESSURE/HIGH TEMPERATURE DRILLING

Utilising the full set of knowledge-leveraging structures available to its Expro location, the High Pressure High Temperature (HPHT) Centre of Excellence combines ad-hoc consultancy with formal commissions to undertake work in a specialised and unique area, for which the North Sea has proved a hard taskmaster and a demanding teacher. Since its inception, the Centre of Excellence has contributed widely to regional developments and Group learning about deep drilling under extreme conditions ...

*Knowledge management programmes... cannot be imposed on an organisation - you cannot conscript tacit knowledge... it can only be volunteered. **

Ad hoc requests were received through the Wells Global Network (WGN) to input into the development of a Casing Design Manual for HPHT Well Engineering. This was completed with Shell International Exploration and Production. This work was undertaken on a non-chargeable basis by Expro-based CoE members.

Shell Namibia requested an appraisal of the high temperature Kudu field. The CoE developed a project execution plan including well design, an alternative (high temperature-rated MDT) testing method, logistics, organisation, procurement and contracting strategy with full project management documentation. A total of 157 man-days was expended at a cost of a little over £100,000. Some \$8 million in well cost savings were made through improved design, drilling and evaluation procedures. Shell Namibia also commissioned consultancy on their oil-based mud disposal policy acceptable by Environmental Impact Assessment. This comprised assessing a fit-for-purpose BM disposal strategy and an investigation into OBM options. For an expenditure of four man-days and some £3,000, Shell Namibia could anticipate \$2 million worth of drilling performance improvements, if OBM is used on Kudu 6.

The HPHT Well Engineering Conference in New Orleans delivered presentations and workshops on design techniques and procedures as well as HPHT new technology requirements. This led to Shell US follow-up requests about HPHT tubulars and connections, wellhead temperatures, pressures and packer fluids. A link has now been established with the US HPHT website. The cost to the team was around £7,000: the conference stimulated exchanges on HPHT practices in South Texas, shallow and deepwater Gulf of Mexico and the North Sea. Future benefits with potential multi-million dollars savings will result if a technology is identified to enable drilling depleted reservoirs.

Nederlandse Aardolie Maatschappij required assistance with High Pressure High Temperature offshore development design and onshore exploration design. For a £20,000 outlay, Nederlandse Aardolie Maatschappij has benefited from fit-for-purpose well design based on HPHT expertise, standardisation and well integrity.

The China National Oil Company (CNOC) visited Expro to research Shell's global capability on HPHT well design and mud operations. For three man days of efforts, Shell China was able to demonstrate Group capability and local application to CNOC and, by association, the Chinese Government.

Norske Shell and Expro established a programme of HPHT learning transfer, peer reviews and exchange visits between the UK and Stavanger, estimated at £12,000 cost. Potential savings estimated at £1 million resulted from standardisation, sharing contingency materials and equipment and a 'Drilling the Limit' project management approach to the HPHT exploration campaign.

 *Pieter de Bordes*
Shell Expro, UK

DEEP WELL EXPLORATION – EXPRO AND SHELL BANGLADESH

In a joint venture with Halliburton Energy Services and Shell, Cairn Energy – the original operator of the Sangu Field in Bangladesh – carried out preliminary well design studies for a deep near-HPHT exploration well. This was designed to penetrate the formations underlying the existing Sangu Field.

Following consultation with Brian Coakley and Frans Van Hoorn in Shell Bangladesh and at Shell International Exploration and Production's request, Shell Expro were invited to review, comment and provide input into this well design, as Shell would assume operatorship of the concession prior to spud date.

Previous attempts to appraise these structures had been unsuccessful due to a number of significant technical challenges. In addition to the technical challenges of drilling a near HPHT well, there were challenges of rig mobilisation, contractual agreements and generally gearing up for a demanding operation in a logistically remote area.

Following several review meetings and discussions with the Cairn Energy design team in Edinburgh, it was agreed that the original casing design was underrated, particularly with regard to the intermediate casing.

High pressure water influxes had been encountered at previous unsuccessful attempts to drill to the proposed depths.

The production casing was also considered 'very marginal' to adequately contain full operational loading in light of anticipated high thermal loadings / downrating factors.

The findings were accepted by Cairn Energy and Halliburton's management and design teams. Cairn Energy, still in the 'driving seat' at that point, actively and diligently sourced alternative pipe, which was mutually acceptable, with a very short lead time.

To enhance actual drilling operations, a visit was made by Expro staff (drilling specialists and colleagues of the HPHT CoE).

Having reviewed the logistics support, manpower requirements and equipment specifications in conjunction with the work programme in Aberdeen they travelled to Bangladesh to present their recommendations to the Well Delivery Team.

It is understood that many of their recommendations were accepted and acted upon, e.g. primarily not to underestimate the complexity of the job and to man up appropriately.

The business value of this collaboration was potentially greater than \$5 million, should loss of pressure integrity of the casing have resulted in a serious well control incident.

 *Brian Coakley*
Shell Bangladesh

"By working together with the Cairn Energy design personnel, and then getting management commitment, a challenging work programme was undertaken, while minimising potential risk to a) personnel, b) the environment and c) serious financial exposure."

Bruce McEwan,
Shell Expro, UK

*There is a Welsh word "cynefin", which is difficult to translate into English language. "It describes that relationship: the place of your birth and of your upbringing, the environment in which you live and to which you are naturally acclimatised." (Sinclair 1998). This concept of wholeness and history is what outstanding organisations are all about. They have the trusted relationships and confidence that comes from a community with common values and a common story about their history, however short. **

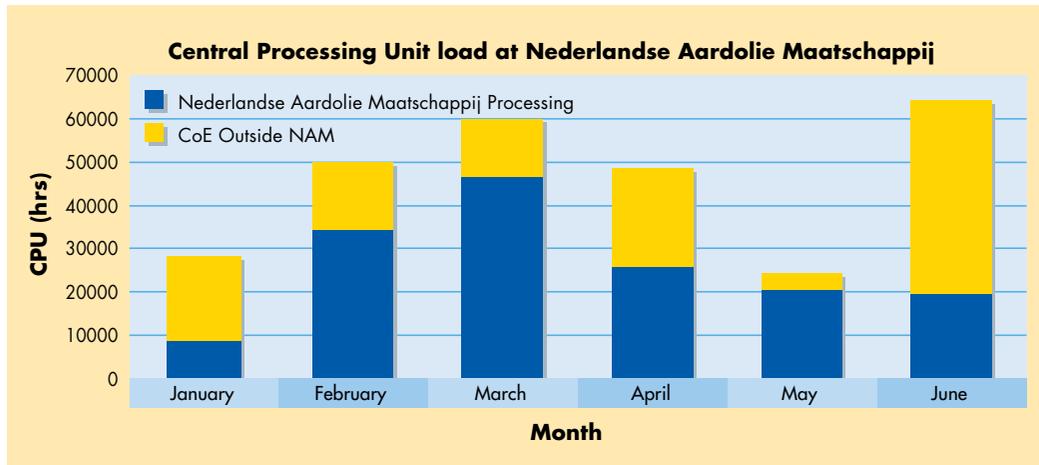
PRE-STACK DEPTH MIGRATION

Unparalleled experience, outstanding technical competence and a powerful computer processing infrastructure are the characteristics of the Nederlandse Aardolie Maatschappij/ Shell Geoscience Services Pre-Stack Depth Migration (PSDM) Centre of Excellence, making it a superb resource for reliable prospect evaluation and field development. The NAM processing team has delivered more than 20,000 km² of 3D land and marine PSDM data. The value added by PSDM is some \$50 million annually in NAM alone. Building on this local success, the expertise of the PSDM CoE can now be projected to every operating unit allowing global access to the most powerful imaging software and best geoscience in the business.

The PSDM Centre of Excellence saw a considerable reduction in computing unit costs by 21% over the first half of 2000, due to the optimal use of Nederlandse Aardolie Maatschappij computing infrastructure by large migration jobs for Shell Expro, run from Shell Geoscience Services in Rijswijk. The structural nature of these savings means a permanent future benefit to the Group.

It is expected that involving Shell Geoscience Services with the resulting competitive computer costs will trigger more work.

The graph reports more efficient use of a Shell Group resource to help reduce cost while sharing benefit:



CENTRES OF EXCELLENCE

PRE-STACK DEPTH MIGRATION (PSDM) – Nederlandse Aardolie

Maatschappij/Shell Geoscience Services

GLOBALISED SEISMIC COMPUTING FROM NAM AND EXPRO

The co-location of computer processing units to execute migration work is not essential as Nederlandse Aardolie Maatschappij proved for Shell Expro in its seismic depth migration programme in 1999. Some 400 km² of Expro's Mandarin and Turnstone fields in the Central North Sea were required to be pre-stack depth migrated by May and the prevailing industry climate militated against expensive expansion of local CPU capacity.

Nederlandse Aardolie Maatschappij and Expro co-operated in the development and implementation of data-exchange and management procedures before executing the image processing at Nederlandse Aardolie Maatschappij's computing centre and feeding data back into Expro's job management system. Part of the computer intensive work was done at Nederlandse Aardolie Maatschappij in Assen whilst the geophysical part of the migration work was still done at Expro in London and Aberdeen. This globalised seismic computing solution and procedure rationalising model is available for operating units throughout the Shell network.

Shell Expro's Sean Inde PSDM project is an example of inter operating unit knowledge and resource sharing. Model building and updating was done by Shell Expro whilst migration job generation and execution were entirely managed by Nederlandse Aardolie Maatschappij in close co-operation with Expro in Aberdeen. This enabled Expro to benefit from Nederlandse Aardolie Maatschappij's best practices for large scale PSDM cluster projects and to concentrate on the model building and updating. In turn this partnership also allowed Nederlandse Aardolie Maatschappij to include Expro expertise in its own workflows. This solution was followed by Shell Geoscience Services in Rijswijk for Shell Expro's large PSDM projects in 2000.

MAINTENANCE STRATEGY AND RELIABILITY ENGINEERING

The Centre of Excellence in Maintenance Strategy and Reliability Engineering has actively supported Shell Gabon, Shell Petroleum Development Company Nigeria, and Brunei Shell Petroleum in various stages of their Reliability Centred Maintenance (RCM) efforts. The CoE provided Root Cause Analysis (RCA) training and implementation support to Shell Gabon. This operating unit sees RCA as an important tool in achieving their 'Produce the Limit' targets.

The CoE has considerable technical experience in option selection decisions in new and change projects, using advanced mathematical simulation tools. Recent applications include the Brigantine project in Expro and the EA and Bonga projects in Nigeria. The Expro standard 'Operations in Projects' helps get the operations and maintenance inputs to projects at the right time, and can be obtained through the CoE.

The CoE also works closely with other CoEs and Global Consultants, e.g., in Instrumentation & Control, to support OUs like Shell Gabon with Risk Based Inspection (RBI) and Instrumented Protective Function (IPF) training.

Today's competitive industrial environment demands that engineering systems perform over their entire lifecycle. The CoE enables project managers to identify and include Operations and Well Engineering best practice in their projects and assist teams to produce designs that maximise a facility's Net Present Value by integrating life cycle cost and establish a maintenance strategy consistent with design safety case tasks.

NORSKE SHELL, NEDERLANDSE AARDOLIE MAATSCHAPPIJ AND SHELL EXPRO

Norske Shell has been learning practical lessons from the self-improvement of Expro's Brent team over several years. Throughout Autumn 2000 the company has been gathering experience in new ways of working and innovative approaches to planning, organising and executing work both on- and offshore.

The Maintenance Strategy and Reliability Engineering Centre of Excellence has delivered a detailed maintenance strategy for active fire systems. Apart from the obvious cost-effective advantage of capitalising on what we already know elsewhere, immediate and timely access to a well-defined strategy meant direct application or use of supporting documentation to demonstrate an overall improvement of test intervals.

A further Norske Shell workshop is planned within the A72 Maintain Well and Facilities process, utilising Shell Expro's Brent expertise and experience and the developing relationships between the two companies.

At a strategic information management level, the Expro SAP team has presented to Norske Shell how SAP maintenance management has been organised in their PM and PS modules. This in turn identified several reports Norske

Shell could copy and implement in its SAP PM module for the improvement of work and material management. The company has now committed to joining forces with both Expro and Nederlandse Aardolie Maatschappij in formulating plans for its own forthcoming SAP upgrade.

"We will continue the focus on gaining knowledge across borders and on the exchange of best practice from our colleagues, to achieve our objectives in cost leadership and be the top international exploration and production company of choice in Norway."

**ROOT CAUSE ANALYSIS WORKSHOP
IN SHELL GABON**

In 2000 John Cuckson, Shell Gabon's Technical Manager, was looking for a breakthrough in tackling production unreliability throughout the production process. Along with Shell Global Solutions, Shell Gabon set about pioneering a new programme to achieve this...

Usually confined to the downstream refinery arena, the application of MERIT methodologies to a dual-language, multi-site EP operation in a remote corner of West Africa was a ground-breaking first. As part of the programme, a series of courses including reliability centred maintenance (RCM), risk based inspection (RBI) and Instrumented Protective Functions (IPF) was delivered but by far the most critical part of the programme was to engage and benchmark the entire maintenance organisation.

Production unreliability is seldom due to a single cause. Human failures, equipment malfunctions, out-of-date processes and unexpected environmental changes may all play a role. Sifting through the evidence to reveal an underlying pattern - and then to learn from it - is a demanding task. It is also one that needs to bring many different skills, perspectives and competencies together in the shape of operators, maintainers, designers, analysts and asset managers.

A powerful tool to emerge in this process was Root Cause Analysis (RCA). Material for teaching and coaching the application of this tool was developed and delivered by the Maintenance Strategy and Reliability Engineering Centre of Excellence in Shell Expro. The technique aids the systematic evaluation of what actually happens in any given incident and surfaces the true underlying reasons for failure. It can be taught as an

applied methodology in many different circumstances. In fact it became so well regarded in Shell Gabon that additional workshops were mounted for non-production operations-related departments. Centre of Excellence consultants created and delivered a comprehensive on-site training programme in RCA in both French and English and went on to coach three separate teams in Rabi and Gamba.

Several more programmes are scheduled for 2001-2002 and early results for MERIT already suggest a breakthrough in both practice and performance.

"As one of the means to assist Gabon, MERIT is a novel way of bringing diverse perspectives to bear on common problems. It is already giving us better planning and much more focused failure analyses. Most importantly, it brings the best skills of our workforce together in a constructive environment where we can agree higher expectations than would otherwise have been possible."

*John Cuckson
Shell Gabon, Gamba*

DRAUGEN MAINTENANCE IMPROVEMENTS IN NORSKE SHELL FOCUSED RESULTS DELIVERY 1999

Draugen is already a high-performance production platform, producing 225000 barrels per day of oil from a topside facility originally designed for 95000 barrels. Maintenance costs are about 20 million NOK per annum above the best performers in the North Sea. The aim of the Shell Focused Results Delivery (FRD) initiative is to address this gap, so that Draugen becomes a top quartile maintenance performer.

Øyvind Espeland, Head of Draugen Operation Support, and his team decided that external expert advice would help them achieve their objectives and they would have the benefit of peer review and challenge. The Norske Shell FRD team was receptive and open to suggestions of different approaches and new ways of working.

The Centre of Excellence staff from Shell Expro participated as virtual members of the FRD, aligning their own inputs to suit the Norwegian situation. To enable this, Norske Shell arranged a platform visit and participation in the FRD from the kick-off meeting onwards while the CoE staff organised visits and meetings directly with their discipline counterparts. Similarly, the Norske Shell FRD team members arranged visits to Shell Expro to gain direct experience and talk to a wider group of Shell Expro staff. The CoE provided supporting documents and reports to strengthen the case made by the FRD, especially when approval from the Regulator was required.

The FRD itself was very successful. At the close-out session, attended by ExCom member Linda Cook, the team explained how maintenance costs would be substantially reduced and oil production increased by about

800,000 barrels a year. Additional cost efficiencies and production increases will be worked on in the FRD implementation phase.

Business Value has been calculated at maintenance cost savings of 13.4 million NOK per annum with added value of some \$16 million per annum, calculated at \$20 a barrel.

"Excellent support from the CoE, a major contributor to our success. One important spin-off effect has been the new personal relationships between Shell Expro and Draugen Operations in several disciplines such that further exchange of experience and best practice can be continued for mutual benefit of the operating units. I would give them 10 out of 10."

*Øyvind Espeland
Norske Shell, Kristiansund*

RELIABILITY CENTRED MAINTENANCE IN SHELL PETROLEUM DEVELOPMENT COMPANY NIGERIA 1999

Shell Petroleum Development Company (SPDC) identified their maintenance performance as a key driver to improve technical integrity, increase production availability and reduce unit costs.

To achieve their goal of becoming first-in-class, they put together an Asset Integrity ‘hit’ team, drawing on expertise available within the operating unit network including Shell International Exploration and Production Research and Technical Services, Shell Malaysia, Brunei Shell Petroleum and Shell Expro.

Reliability-Centred Maintenance (RCM), initially developed for aircraft but with increasingly widespread industry application, was chosen as the key tool to achieve best-in-class performance. SPDC lacked RCM background and felt that Expro’s practical experience of RCM’s application and its transfer of that knowledge could help them significantly.

Using RCM along with other innovative approaches in the early 1990s had enabled Expro to reduce maintenance costs by 40% and increase installation availability by 5% over five years.

The experience had taught them how to avoid the pitfalls of RCM projects, the importance of acquiring the right maintenance data, how to work within 'given' parameters such as available spare parts difficulties and precisely whom to engage to ensure implementation success. Although there were a number of RCM methodologies in the public domain, Shell Expro's model was proven in the EP environment and the benefits were demonstrable.

Working closely with the SPDC maintenance team, Expro provided essential interventions such as:

- 1) RCM briefings to East and West Division management illustrating RCM application and benefits
- 2) practical RCM workshops for maintainers and operators
- 3) a seven day training programme for a multidiscipline group of operators

These operators were then assigned to become SPDC in-house experts, building up on-the-ground RCM expertise for the future.

Business Value is estimated by the customer to be 100 times the investment. SPDC has acquired in-house RCM capability and an RCM maintenance programme, adaptable to some one hundred flow stations across the operating unit.

 *Bo Bodegom*
Shell Syria, Damascus

"This was an excellent and progressive piece of work. We will be expanding this programme next year as part of our drive to lower costs and improve system availability. We will continue the involvement of the Maintenance Strategy and Reliability Engineering CoE next year as we believe that they have brought significant value to our work."

Mike Henderson, former Head of Maintenance Systems, Shell Petroleum Development Company

OFFSHORE STRUCTURES ENGINEERING

From 2000, the Centre of Excellence for Offshore Structures Engineering has been providing advice and services on a range of topics including structural integrity, foundation design, installation, decommissioning, topside structural design, and special loadings (e.g. conductor driving, blast design), etc. The following stories are a few examples of work undertaken by the CoE. It is worth noting that the work goes beyond structures for oil and gas production as is illustrated by the support given to the Blyth offshore wind project.

BLYTH – THE DEVELOPMENT OF UK’S FIRST OFFSHORE WIND FARM

Wind power has been a core technology in the portfolio of Shell Renewables since 1998. The growing profile of renewable energy supply, which will be a multi-billion dollar market over the next 10 years, has several ‘drivers’ including the need to secure diverse energy supplies, a commitment to reduce carbon monoxide emissions and an ambition by governments in the UK, the Netherlands, Denmark, Germany, Belgium, France and Sweden to exploit wind energy in their offshore environments.

In co-operation with Shell Renewables, a small team of Shell engineers has worked with industry partners to develop the Blyth Offshore Wind Farm. With a capital investment of £4 million, this strategic pilot has engaged several investing partners and attracted the interest of government and non-government organisations, such as the Department of Trade and Industry, the European Community, Greenpeace and the Royal Society for the Protection of Birds (RSPB).

AMEC Border Wind developed the project to conceptual stage, whilst in the process securing all major licences and consents over three years.

They were joined in the implementation phase by Powergen, a Shell project manager and technical experts from the Offshore Structures Engineering and Underwater Activity Services Centres of Excellence. The CoEs' input has been invaluable, covering a wide range of related disciplines, such as geophysical/geotechnical, metocean, offshore structures, underwater, electrical mechanical and safety management.

The Blyth Offshore Wind Farm was opened by Helen Liddle, the UK Energy Minister, on 7th December 2000.

The CoE for Offshore Structures Engineering was also a key contributor to technology development for offshore windparks (e.g. installation methods) and has performed a number of value engineering/peer assist reviews. CoEs in Shell are now recognised by the Shell Renewables wind power team for their unique in-house competences, which will undoubtedly contribute to larger developments in the UK, the Netherlands and elsewhere.

"This project represents a number of firsts for the industry: the first offshore wind farm in UK waters and the first project for Shell Renewables, Powergen Renewables, NUON UK and AMEC Border Wind. It's also the first time AMEC Marine has used its jack-up rig for a wind turbine.

Throughout the project, the Offshore Structures Engineering and Underwater Activity Services CoEs have been critically important in installing the turbine technology and maintaining the highest standards of safety on the job. With the lessons learned from this project we can be confident that Shell is well-equipped to manage offshore construction risks for offshore wind farms, one of our future growth businesses."

*Huib den Rooijen
Shell WindEnergy BV, Amsterdam*

CENTRES OF EXCELLENCE
OFFSHORE STRUCTURES ENGINEERING

NORSKE SHELL – NEW BUSINESS FOR THE DRAUGEN PLATFORM

The Centre of Excellence for Offshore Structures Engineering was contacted by Norske Shell to assess the technical viability of incorporating significant additional loads onto the Draugen platform from the proposed Mikkel tie-in.

The technical feasibility to proceed with the development was confirmed for this ‘step change’ in topside load distribution.

SHELL IRAN OFFSHORE – SAVINGS ON OFFSHORE TECHNICAL QUALIFICATION

The Soroosh and Nowrooz platforms, comprising a multi-structure offshore development operated by Shell Iran, commissioned a technical qualification for the purchase of conductor connectors. This was to account for fatigue loading induced by conductor driving and in-service loading.

This work enabled cost savings of around \$1.5 million to be made. In addition, the CoE developed several low cost options for temporary support configurations of pre-drilled conductors to enable early production of the Soroosh and Nowrooz fields. Detailed dynamic analyses were done within a tight time scale to assess the technical feasibility of the most attractive options.

UNDERWATER ACTIVITY SERVICES

Acting as a Centre of Excellence for Underwater Activity Services (UAS), Shell Expro in conjunction with Shell Deepwater Services offers expertise and advice on underwater engineering and operations support to the EP and Group global business. The UAS CoE ensures on behalf of its customers in Shell International Exploration and Production / Shell International Oil Products / Renewables that current operations are safe whilst also ensuring that future underwater assets (in any water depth) will be reliable, easy to maintain, decommission and remove in the future.

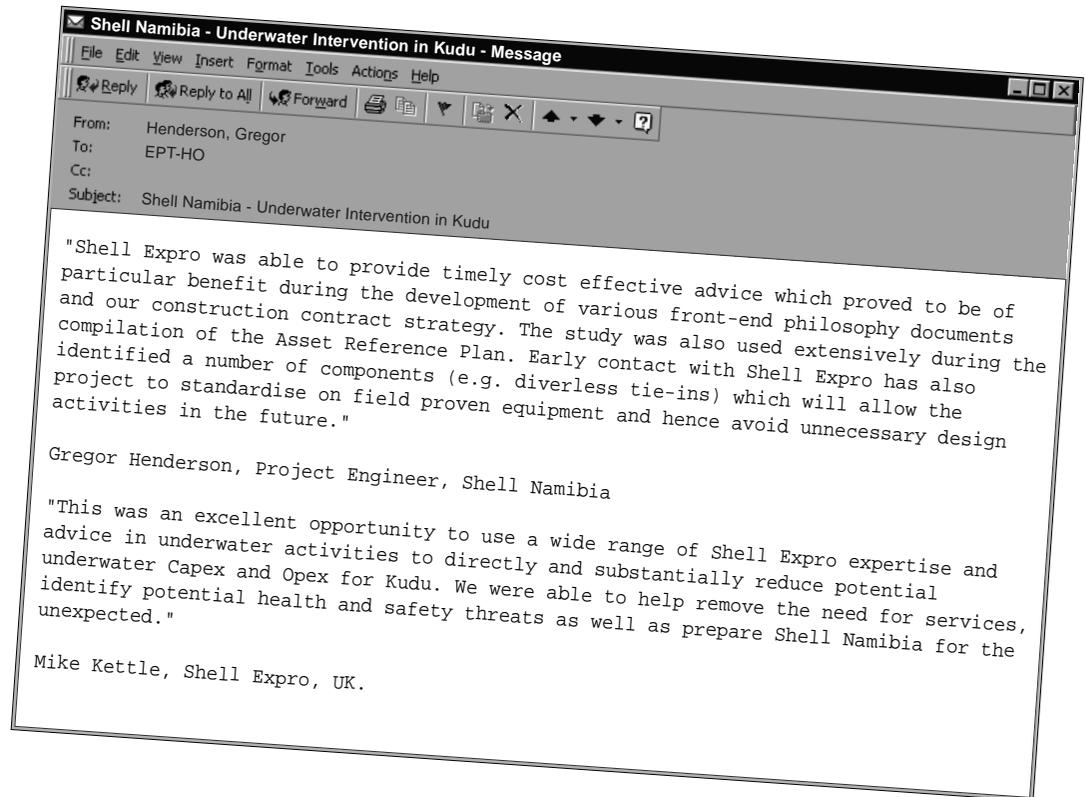
The primary aim is to provide cost effective underwater advice and operational support where required to each development at every field phase. operating units can benefit from continuously recycled, specialist underwater field work experience in managing work efficiently within the parameters of best practice in health, safety and protection of the environment. Based within Shell Expro the team delivered added value of \$57 million to Expro in 1999 and estimated \$6 million added value to the Group.

SHELL NAMIBIA – UNDERWATER INTERVENTION IN KUDU

Kudu is a gas development in 180 metres of water, approximately 140 kilometres off the coast of Namibia. The area has little existing infrastructure and limited local support facilities. The water depth is right on the limit of routine manned diving while wave conditions are similar to marginal Central North Sea operations. The development required an Underwater Intervention philosophy to be created that took account of its specific conditions. Expro was approached on the basis of its underwater services reputation and experience and commissioned to develop an appropriate intervention strategy.

Shell Expro had undertaken many such assignments in the North Sea sector and for other Shell operations in similar areas, such as Malampaya and Bonga. The basic theme was to design out intervention as far as possible, but with recognition of the practical limitations; therefore careful preparation and consideration was given to future planned and unplanned intervention. The customer also requested that the work include detailed assessment of the demands of initial installation and construction of a largescale offshore development in a remote location.

Drawing on accumulated experience and knowledge built up over many years, the CoE prepared a report addressing full lifecycle underwater intervention requirements in the context of Shell's challenging infrastructure conditions in offshore Namibia. The report is available from Shell Expro. Business value was calculated at greater than \$1.6 million with quantum lifecycle returns and benefits.



*In most large project environments, knowledge is disclosed over time scales measured in years not weeks. Story telling has proved a powerful knowledge disclosure technique in this respect **

SHELL HAZARD AND RISK EXCHANGE (SHARE)

The SHARE team has provided consultancy and solutions provision to many Hazard and Risk management issues in operating units and New Venture Operations over the past two years. The strength of having experienced staff with complementary skills in Shell Exploration and Production Technology Applications and Research, Shell Expro and Shell Global Solutions has meant that advice and services can be provided promptly and efficiently across a wide range of HSE matters, particularly in the Project HSE Hazard and Risk Management area.

The team has a core of multi-discipline technical staff - four in SIEP, five in Expro and 20 in Thornton - plus the wider resources of their respective organisations and many approved specialist contractors. Its objective is to ensure consistent and effective application of Risk Management techniques for hazards associated with EP facilities and activities. By maintaining a consistent high quality assessment, they assist in reducing risks to a tolerable level for the minimum cost.

ABU DHABI HSE CONSULTANCY

Shell Gas Abu Dhabi has jointly completed with Abu Dhabi National Oil Company the first phase of a study on Sour Gas Developments. This is planned to produce some 800 MMscfd of sour gas (33% H₂S, 10% CO₂), treat it and then use the sour or acid gas for enhanced recovery. In this HSE critical activity they needed a consistent and high quality of HSE project input throughout the 10 month study.

The SHARE Team provided a team leader and focal point from Shell Exploration and Production Technology Applications and Research, who also led the HAZID study and managed the Environmental baseline study. SHARE also provided an HSE Plan for the project, with a detailed approach from feasibility study to the abandonment phase and co-ordinated this work for the study duration.

Specialist resources were supplied from other team partners, including dispersion modelling and quantified risk assessment from Shell Global Solutions, development of a plant layout and Layout Risk Assessment from a Shell Exploration and Production Technology Applications and Research consultant and team leadership and HSE risk management advice for a review of drilling activities.

SHELL CANADA FIRE ENGINEERING HAZARD AND RISK ASSESSMENT

The Sable Island project in Shell Canada contacted Exploration and Production Technology in Rijswijk to seek the support of a fire engineering specialist to participate in a project review and provide specialist design advice. The SHARE team was able to deploy its members from Shell Expro for specialist input in support of Shell Canada's hazard and risk management assessment.

*"Managing knowledge assets.... in a fast-moving information economy is the cognitive equivalent of white-water rafting, of going with the flow and trying not to capsize. It requires alertness, flexibility and a light and buoyant craft. It will not do to shoot rapids in a paddle-steamer" (Boisot 1998). White water rafting requires trust, common understanding and common stories that bond the community of rafters. To achieve this we will need to rediscover the story telling skills and consequent resilience of our Hunter-Gatherer Ancestors. **

SUBSIDENCE & COMPACTION

Hydrocarbon production may lead to surface subsidence due to reservoir compaction, a simple and unavoidable fact of life in Shell's exploration and production sector. Therefore the consequent impacts of an exploitation region need to be fully understood in terms of the long-term economic viability, existing technical infrastructure (e.g. well integrity) and the environment.

Shell's strong historical connection with the Netherlands provides a unique perspective on the technically complex issues of subsidence and compaction through hydrocarbon extraction. That history began with a moving coastline already brokering an uneasy balance between naturally subsiding land and varying sea levels over thousands of years. It continues to this day within a shifting arena of technological development, economics, politics and public opinion, for which our corporate 'learning curve' has been steep and challenging.

Nederlandse Aardolie Maatschappij (NAM) in conjunction with Shell Exploration and Production Technology Applications and Research (SEPTAR) offers a Centre of Excellence for research, analysis and measurement in compaction and subsidence, seismicity, subsidence engineering and environmental advice.

NEDERLANDSE AARDOLIE MAATSCHAPPIJ AND SHELL INTERNATIONALE PETROLEUM MAATSCHAPPIJ

In 1991 Shell Internationale Petroleum Maatschappij requested Nederlandse Aardolie Maatschappij to perform a subsidence study for Shell Petroleum Development Company's EA field in Nigeria. The stacked unconsolidated reservoirs could present an engineering problem for the platform design. The study supported them in the decision making.



4



DISTRIBUTED TEAMS

Distributed teamwork is the ability of business teams to work productively together, accessing and working on information simultaneously, regardless of their physical location and timezone. Rapid advancement in desktop computing, communications technology and 'groupware' PC products, coupled with decreasing prices and a deeper understanding of organisational workflow, now make possible a level of remote collaboration unimaginable only a few years ago.

The on line, face-to-face sharing of information and knowledge supported by distributed teaming technologies, enables a rich bandwidth of communication that clearly surpasses the traditional telephone call, email or internet chat-room. Shell has been taking advantage of such developments by aligning its technology infrastructure, management processes and people skills with operational business suitable for the application of global virtual teams.

The Shell EP Organisational Performance and Learning team offers a complete methodology for distributed team implementation with complete support, facilitation and coaching programmes to get global staff teams up-and-running.

Here are some of the company's early success stories in making global distributed teams happen....



DISTRIBUTED TEAMS

WORK IN ABU DHABI FOR SOGAT II

WORK IN ABU DHABI FOR SOGAT II

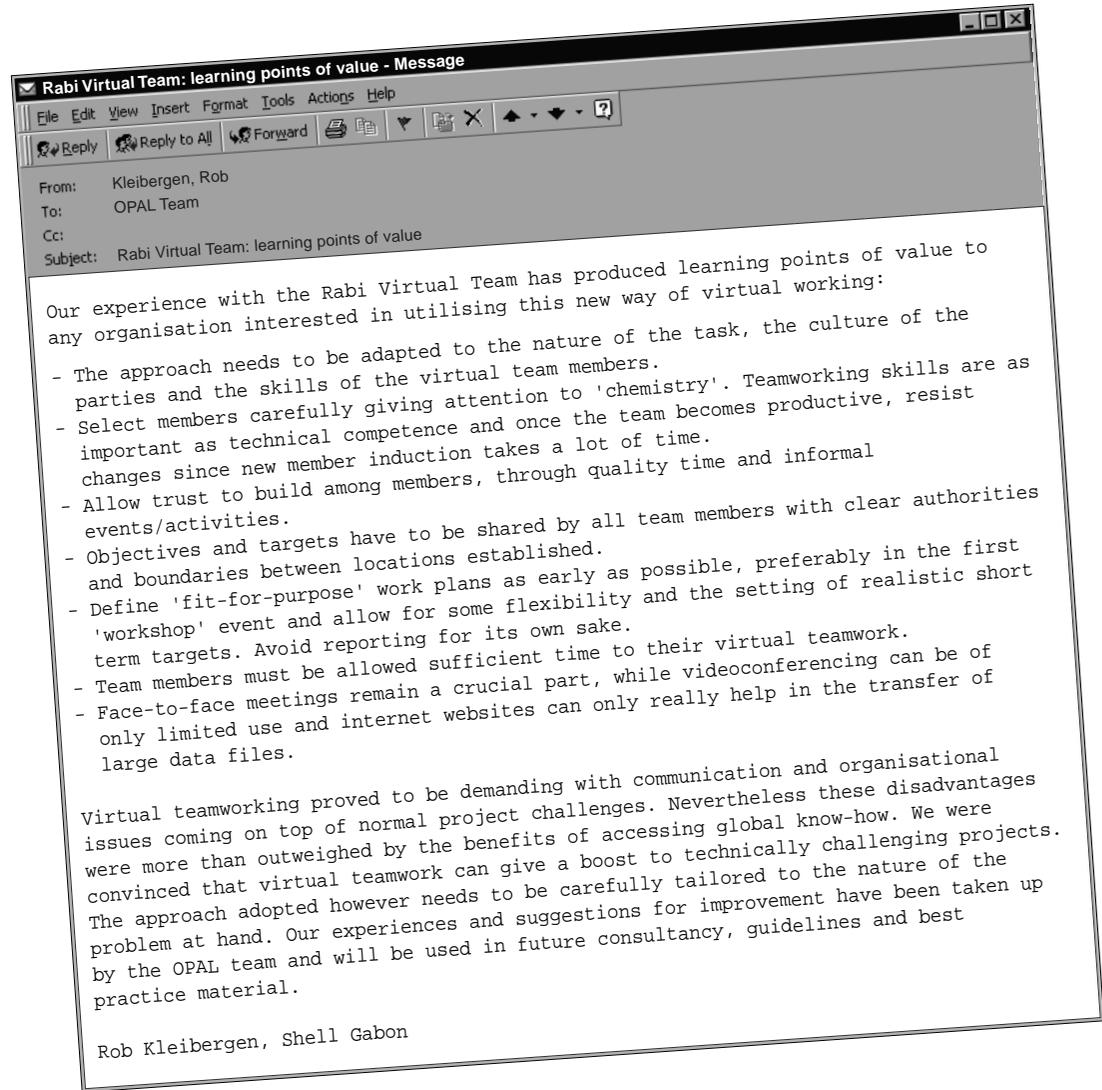
In 2000, consultants from Shell International Exploration and Production in Rijswijk and the Woodside Opportunity Framing team in Australia delivered a team and project kick-off workshop to the Abu Dhabi Sour Gas Team (SOGAT). This was the first workshop in which capabilities and experience in new ways of working and Shell's Capital to Value (C2V) initiative including opportunity framing were combined into one.

Objectives of the workshop were building, organising and energising the team, as well as delivering a project roadmap, comprising key elements of the project plan, such as key decisions and milestones, drivers and barriers and stakeholder analysis. Participants perceived the workshop, and in particular the combination of new ways of working and opportunity framing elements, as very valuable.

The Sour Gas Team in Abu Dhabi, a joint effort of Shell and ADNOC, aims at formulating a development plan for Arab sour gas production and selecting a reservoir for sour/acid gas injection. This project should help fill the forecasted gap between gas production and demand in Abu Dhabi in the near future.

OPAL hopes to have the opportunity to cooperate on similar team and project kick-off workshops, when requests for these are received.

 *Joost Zegwaard*
Shell Int. E&P, Rijswijk



THE RABI VIRTUAL TEAM: MOBILISING GLOBAL KNOWLEDGE TO SOLVE LOCAL PROBLEMS

Rabi is the largest oil field in Gabon with a STOIP of 1750 MMstb and an estimated ultimate recovery of some 850 MMstb. Coming on-stream in 1989, the maturing field with its water and gas breakthroughs, has been gradually limited in its oil production, coming off plateau in 1998. In mid 1997 a performance, development and operational review from a multi-disciplinary perspective was undertaken through the application of a Virtual Project Team concept, linking Gamba in the Gabon and Shell International Exploration and Production in Rijswijk: the ambitious target – Raise the Rabi Net Present Value by increasing the ultimate recovery of the field by 10% or 80 MMstb.

The Rabi Virtual Team saw its primary roles from the outset as:

- Providing contacts, expertise and information to identify and apply Shell Group and industry-wide best practices to Rabi – its motto was “mobilise global knowledge to solve local problems”
- Acting as a resource broker, making specialist resources available to Shell Gabon to work on focused projects which do not usually justify an increase in local establishment

- Fundamentally challenging the development rationale and technical solutions to identify and work out possible breakthrough opportunities
- Efficiently implementing the available state-of-the-art technologies

Eight virtual teams were created with core members from Gamba and Rijswijk and each project undertaken was assigned a coordinator responsible for progress tracking and reporting. All teams sought and found outside expertise during certain project phases. For example, visits were paid to Norske Shell to compare Rabi with Troll and Petroleum Development Oman (Through Tubular Drilling) while industry experts from Arco, Prudhoe Bay were consulted to implement best practice.

Team members had weekly local progress meetings in both locations, followed by a telephone or videoconferencing meeting with most members present.

Projects undertaken by the Rabi Virtual Team in practice included:

- Production Scenarios and Facilities de-Bottlenecking
- Well Review and Remedial Action
- Novel Horizontal well completions (‘Tilted Bucket’)
- Reduction of Well Costs

- Well Re-surveying
- Location of remaining oil by cross-well seismic
- Production System Optimisation Model
- Wax Inhibition

By Q4 1998 the Rabi Virtual Team reached its end with most of the expected benefits being achieved. A post-implementation review was carried out by the Organisational Performance and Learning team. In total it is estimated that the Virtual Team approach directly contributed to an increase in recovery of 17 MMstb, corresponding to a net present value of \$30 million at \$14 a barrel. Scope for another 22 MMstb additional recovery was identified.

In terms of non-tangible benefits, team members enhanced their skills and personal network while the Rabi Virtual Team helped change the mindset within Shell Gabon, resulting in increased openness to the outside world. Many new contacts have been established within the Group as well as with service companies, which will continue to facilitate information exchange in the areas of horizontal well technology and thin oil rim developments.

THE ATHEL GLOBAL VIRTUAL TEAM – PETROLEUM DEVELOPMENT OMAN/SHELL INTERNATIONAL EXPLORATION AND PRODUCTION KNOWLEDGE GLOBALISATION IN THE EP SECTOR

Discovered in 1989, the intra-salt Athel silicilyte is a unique source and reservoir rock found in the South Oman Salt Basin, where slabs of Athel silicilyte are encased in salt at four to five kilometres depth. The play is characterised by light sour oil, hard over-pressures and a high-porosity, low-permeability micro-crystalline quartz matrix rich in organic matter.

Production tests illustrated both the challenges and the opportunities to extract hydrocarbons from the unique reservoir. Seven years after the initial discovery 15 million cubic metres had been booked in Al Noor out of an expectation STOIP of 210 million cubic metres while a second discovery in Al Shomou strengthened the play's significance in the exploration portfolio. While a development appeared attractive, Al Noor failed to rank in Petroleum Development Oman's development portfolio and it was felt that a technology breakthrough was needed to transform exploration expectation into production reality.

A 'difficult' field requires focus and a genuine desire to make it work. Treating such assets as a peripheral activity using conventional approaches may result in early screening out and missed opportunities.

Indeed early workshops failed to engage knowledge of the environment fully and it became apparent that a dedicated Athel team in Petroleum Development Oman was needed. Athel was moved from an exploration to a development unit and while that provided the necessary focus to mature a field development plan, it created the false impression that Athel was being addressed efficiently and about to be resolved.

In the early stages there were administrative complexities between the involved departments, creating unnecessary tension and hampering technical integration and consistency. A kind of email-fuelled electronic warfare developed and a growing knowledge gap between Petroleum Development Oman and Shell International Exploration and Production, linked to their varying capacities to commit dedicated project time, also became apparent. It proved difficult for any one to maintain overview and ensure cohesion.

This *de facto* emergence of a virtual team, with all its tensions and challenges, was given real impetus with a Q1 1998 workshop. We proceeded to build the technology plan around six technology clusters – Characterise the Rock, Find More Athel, Optimise Product Flow, Model the Reservoir, Enhance Oil Recovery, Reduce Well Cost per Barrel – with each jointly run by focal points in both Petroleum Development Oman and Shell International Exploration and Production. They were responsible for the planning, execution and implementation of projects in their area.

An Athel focal point also doubled up as Technology Co-ordinator and focused on the overall process. This re-organisation created a strong sense of ownership and responsibility with the entire Petroleum Development Oman team committed to ‘making it work’.

The main technical and financial results to date are as follows:

- Coring advice: state-of-the-art procedures and new developments led to successful core recovery
- Customised equipment allows micro-permeability measurement under stress and proves the limited permeability degradation during depletion

- Organic matter is characterised, with direct implications on reservoirs characterisation and exploration portfolio management
- A comprehensive microstructure sheds light on basic rock properties and provides the foundation for a reservoir model
- Improved definition on seismic opens up new lateral prediction possibilities in the intra-salt Athel slabs
- The biggest fracs in the Middle East placed in two Athel wells remove the last hurdles to reserves booking and to a commitment towards the Phase 1 Al Noor development
- Water- and gas-flooding studies led the way to growth opportunities
- The unit technical cost has decreased from \$10 stb to less than \$7

DISTRIBUTED TEAMING IN RESERVOIR ENGINEERING – IMPROVING CUSTOMER SERVICE WITH COLLABORATIVE SOFTWARE

A number of operating unit reservoir engineers throughout the world used to send their large reservoir simulation data sets to Reservoir Engineering Support through a courier tape service, typically taking up to one week. Work on the data was completed and the data returned to the customer. Any further iterations of the process could easily result in a delay of up to three weeks.

By utilising on-screen data-sharing Microsoft NetMeeting applications such as Xvision (FrontEnd, MoReS, GFPT) a number of PC applications such as PANSystem, Word, Powerpoint and Excel can be viewed and manipulated by multiple users in various locations around the globe at the same time. Implementation of this new collaborative software environment took about one and a half days of meetings to determine the optimum environment and install it on our hardware.

The resulting saving in elapsed time – hours instead of weeks – has been key, especially if the simulation study is on the critical planning path. Any delay could impact on the project schedule and ultimately the production start-up.

Our learnings:

- Use the telephone ‘hands-free’ to reduce bandwidth use and allow clearer voice communications
- Make sure local Information Technology staff install the tool and check functionality
- Coach other team members on the tools’ use and benefits

URDANETA WEST DISTRIBUTED TEAM – FROM ZERO TO 100 IN 90 DAYS

After the initial appraisal phase of Urdaneta West which resulted in boosting production from 5,000 barrels per day to some 40,000, Shell Venezuela recognised it had to upgrade the potential to 60-70,000 barrels if it was to recover its investment. Shell International Exploration and Production was contacted to help enable a technical breakthrough in marginal field development, lacking the local resources to undertake a high technology study on its own. The problem of tough carbonate development and heavy crude lifting required innovative techniques which could only be gained by merging expertise across boundaries, regardless of geographical distance and time differences.

A distributed team was established between SIEP and Venezuela with a ninety day remit to 'breakthrough'. The Organisational Performance and Learning team was engaged to implement appropriate methodologies and communications tools. The process involved:

- Full implementation of the OPAL team's People, Process and Technology methodologies and workshops
- Team selection from Maracaibo, Caracas and Rijswijk with additional interfaces to Shell Canada, Petroleum Development Oman and Nederlandse Aardolie Maatschappij

- Capturing processes, roles and responsibilities in a 'team handbook'
- Alta Vista Forum, email and conferencing protocols and facilities establishment
- Microsoft NetMeeting and Virtual Network Computing implemented and training provided

The benefits for Shell Venezuela flowed through quickly, including:

- A breakthrough technical solution was found and an implementation plan developed in a highly compressed timeframe, the key elements being achieved in 30 days
- Knowledge was transferred rapidly with full remote data collaboration throughout
- Cost savings estimated to have covered direct OPAL costs two to four times over
- Shell Venezuela now has core new ways of working methodologies for the future



STORIES FROM THE EDGE

Acknowledgements

The Shell International Exploration and Production Organisational Performance and Learning team based in Rijswijk, the Netherlands would also like to gratefully acknowledge the help of its Shell colleagues around the world in sharing their stories.

References

- * The New Collins Concise English Dictionary
- * American Heritage Dictionary of the English Language (Third Edition)
- * The Concise Oxford Dictionary

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Supply

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Stories from the Edge

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