SYNERGY

THE EXCELLENCE PLATFORM

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Green planet, green economy-
a growing harmony.

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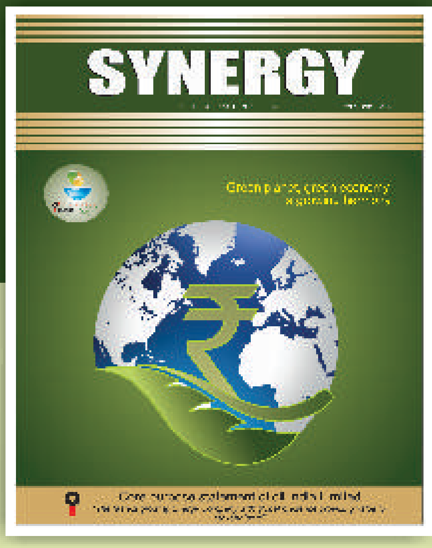
"The fastest growing Energy Company with global presence providing value to stakeholders"



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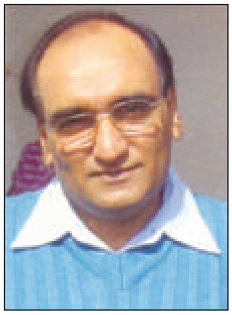
Oil India Limited is a fully integrated E&P company in the upstream sector. With a Pan-India presence, OIL has Participating Interest in blocks in eight countries overseas viz Libya, Gabon, Nigeria, Yemen, Iran, East Timor, Venezuela and Egypt besides a product Pipeline in Sudan

Strengths

- Integrated E & P company
- Large acreage in Category-1 Basin
- Consistent small to medium size discoveries
- Consistent performance
- Committed workforce and sound industrial relations
- Reservoir Management of ageing/depleting fields
- Low finding and lifting costs

(Disclaimer: Views and opinions published in this newsletter are the exclusive views of the respective authors only and not necessarily those of the management)

EDITORIAL



Dear Readers,

It's been a long time since we last came out with SYNERGY. Much water has flowed under the bridge since then. OIL is now a listed Company and its IPO was one of the best in Indian markets in recent times. It's shares have shot up 58% (at the time of going to print) over the issue price! Production of both Oil & Gas is increasing; the Company is expanding its footprint and is set to blaze new trails.

On the international front, the blow out of the Mocondo well and the subsequent explosion which caused the worst ever oil spill in US has shocked the world. This has had tremendous ramification in the petroleum industry. The blow out spilled over 200 Million Gallons of oil into the Gulf. BP has spent around $8 Bn as expenses related to the devastating spill and had announce a $20 bn fund to meet its obligations as a consequence of the blow out. What does this mean for the industry? Will the regulations on safety become more stringent? Will all this have an adverse affect on offshore and deepwater exploration? Will the industry learn from the mistakes? Only time will tell.

In the meantime US have ended the ban on deepwater drilling, but have set new rules for the same. "The oil industry will be operating under tighter rules, stronger oversight, and in a regulatory environment." the US Interior Secretary said in a statement recently.

It's a big lesson for all in the industry.

We have compiled some interesting articles in this issue which I hope you will all like. Please do let us have your feedback and also comments on the issue or on anything interesting! Many thanks to the authors for their effort.

Happy reading!

Arvind Jaini
Editor

Implications of West Asian Supply Interruptions On Global Energy Security

Sara Vakhshouri-Bellenoit

Mrs. Sara Vakhshouri-Bellenoit was born and raised in Iran. She is a PhD scholar in the Center for West Asia Studies, Jamia Millia Islamia University (JMI), New Delhi. She possesses a Master of International Relations from School of International Studies, Jawaharlal Nehru University. She has also Master of Business Management (International Marketing), and is a member of the 'International Association for Energy Economics' and the 'USA Association for Energy Economics'. She served in the Iranian Ministry of Petroleum as a researcher in Petroenergy Information Network, 2001-2004. Mrs. Vakhshouri-Bellenoit served also in the National Iranian Oil Company (NIOC International) as Advisor to the Director of NIOC International, 2004-2005. Since 2005 until 2009, she served as senior market analyst in Oil Pension Fund Investment Company (OPIC) and Pasargad Energy Investment Company in Iran. She has a special interest in "Oil & Politics" and attended and presented papers at various national and international seminars relating to energy and geopolitics. Mrs. Vakhshouri-Bellenoit has edited various articles in which she focuses on energy and oil industry. Her current research interests and specialization includes energy security in Middle East.

1. Introduction

Global energy security system has emerged largely in response to the 1973 oil embargo. During the 1980s and 1990s, energy security declined in importance as oil prices fell and spare capacity stood at high levels. This was reversed in the decade that followed and once more energy security became a priority in policy agendas of most oil importing countries.

It is expected that global economic growth over the next decade will certainly register a fairly steady rise in oil demand. In the years 2000 and 2010 oil and gas constituted 64% of the world's energy demand; by 2020 it will be 68%. Industry should meet this rising demand in an assuring manner by combining reserves, investment, present technology as well as what will be achieved in the future.

Both the energy Information Administration[1] and International Energy Agency[2] predict a growth in global oil demand in the next 20–25 years, non-OECD Asian economies. It is also projected that the world consumption of petroleum products and other liquid fuels will increase from 83 million barrels per day[3] in 2004 to 97 m b/d in 2015, and then to 118 m b/d in 2030 two-thirds of this increase will be in the transport sector.[4] These increases will be driven mainly by the U.S and non-OECD Asia.[5]

It is estimated that OPEC will raise its oil market share to about 49% by the year 2020.[6] Throughout this period, production in non-OPEC countries will be relatively stable due to production increase in developing countries and the production of non-conventional oil to account for production losses in Western Europe and North America.[7] The role of the Persian Gulf is significant. Its strategic importance will further grow within the next 20 years. Nearly half of the proven world oil reserves are embedded in the territory of three countries: Saudi Arabia, Iran and Iraq.

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1 Energy Information Administration (EIA)
2 International Energy Agency (IEA)
3 Million barrels per day (m b/d)
4 International Energy Outlook, 2008
5 EIA 2008
6 IEA 2008
7 Ibid.

High oil prices, threats of terrorist attacks, instability in many oil-exporting countries and the rise in 'oil nationalism' have raised serious concerns about the security of oil supplies. The world has a fear that it may be running out of oil with many observers predicting an imminent oil supply crunch[8] and raising doubts about the size of proven oil reserves in the West Asia and elsewhere.[9]

2. Energy dependency on West Asia

The main concern in energy security is the concept of 'oil dependency'. Due to a geological accident, oil is found and extracted in different regions from those in which it is mostly consumed. A small group of countries, mainly in the West Asia, process the bulk of the world's oil reserves and are responsible for a large share of global oil production.

Since World War II, oil has displaced coal as the principal source of energy in Western Europe and Japan. Three-fourths of Europe's oil and 90% of Japan's comes from West Asia. In 2007 West Asia was responsible for 31.2% of global oil production and around 61.5% of the world's proven reserves.[10] Moreover, some 40%of global gas reserves are located in West Asia. Global oil consumption is dominated by the US, the European Union, Japan and China. In the year 2007, these were responsible for around 57% of world consumption. The US alone accounts for almost a quarter.[11]

Although some of these countries are important oil producers, domestic production accounts for about one-quarter of their consumption and consequently these countries have to rely on oil imports to fill the gap. Trade movements in 2007 indicate that West Asia exported more than 20 m b/d, while Europe, Japan and the US imported more than 32 m b/d. Oil dependency is likely to increase in the future for North America, Europe and Asia as they possess less than 10% of the world's proven reserves.[12]

Given that West Asia has the largest worlds' oil reserves and is responsible for a large share of

global oil production, security of West Asian oil supplies is central to the oil security debate. In fact, some analysts consider that the most important facet of energy security is limiting vulnerability to disruption given rising dependence on imported oil from an unstable West Asia.[13] Others equate the improvement of energy security with reducing dependency on West Asia oil.

Relying on oil imports would not constitute a source of concern if oil continues to flow smoothly from surplus to deficit areas. Thus, in addition to oil dependency, an underlying theme is that the regular flow of oil to importing nations may be subject to disruptions. This conjunction of the concepts of oil dependency and vulnerability with serious disruptions in oil supplies constitutes the very basis for energy security concerns. This is reflected in widely-used definitions of energy security. It could be defined as the "availability of sufficient supplies at affordable prices".[14] Some scholars, such as Kalicki and Goldwin, similarly define energy security. They call it the "provision of affordable, reliable, diverse and ample supplies of oil and gas and their future equivalents and adequate infrastructure to deliver these supplies to market".[15]

In addition to disruption, these definitions also incorporate the concept of 'affordable prices'. The concept of affordability is, however, very ambiguous. Definitions of affordability vary widely; what is affordable to one country may not

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8 Campbell CJ, Laherrère JH. (1998), " The End of Cheap Oil." Scientific American, March.

9 Simmons M. (2005), Twilight in the Desert: The Coming Saudi Oil Shock and the World Econom, John Wiley and Sons.

10 BP Statistical Review 2008

11 Ibid.

12 Ibid.

13 Martin WF, Imai R, Steeg H. (1996), "Maintaining Energy Security in a Global Context. A Report to the Trilateral Commission". Trilateral Commission, June.

14 Yergin, D. (2006), " Ensuring Energy Security", Foreign Affairs, March/April.

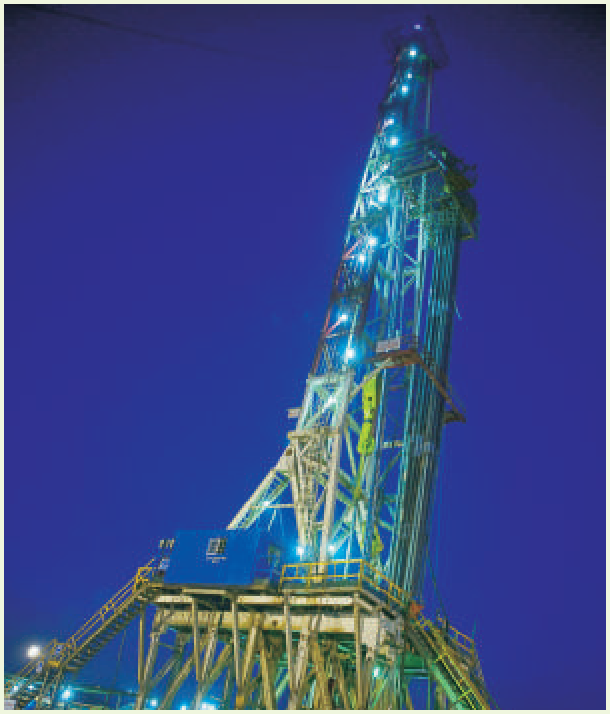
15 Kalicki, JH, Goldwin, DL. (ed). (2005), Energy and Security – Toward a New Foreign Policy Strategy. Washington, DC: Woodrow Wilson Center Press.

be affordable to another. Furthermore, the above definitions are biased in the sense that they only consider energy security from the oil importers' perspective.

Very low oil prices, which are affordable to consuming countries, may undermine the energy security of oil-exporting countries since oil revenues represent the main source of their income. Thus, from a producer perspective, low oil prices constitute a major threat to their security. In this paper, energy security is analyzed in terms of potential factors or events that disrupt the flow of oil through the supply chain without any consideration to affordability.

It is important to mention the following features of the definition which are used. First, there are many causes of disruption. Disruptions can be caused by technical failure; weather-related events (such as hurricanes and storms), strikes, terrorist attacks, on oil facilities, wars and civil strife, regime change which may restrict the capability of a country to export and a deliberate restriction of exports. The dynamics of supply and demand in the oil market may also result in market dislocations with considerable impact on oil supplies. In the worst possible scenario, global oil supply falls short of global oil demand due to a lack of investment or peak oil. [16]

Furthermore, the oil market can experience a reduction in available supplies due to a change in the policy of exporters. Disruptions and dislocations can also occur in any segment of the supply chain. The supply chain from the resource holder to the end user is very long and includes refining, international and local transportation, storage and delivery. And the impact of disruptions is not uniform. Some disruptions, such as those caused by technical failures, occur often but have limited impact on global oil supplies and productive capacity. Disruptions due to natural disasters occur infrequently but their impact on oil supplies can be significant in the short to medium term. Some natural disaster disruptions are less regular. But their impact might have both short-term effects on oil supplies and long-term effects on productive capacity.



The above mentioned points demonstrate that the concept of energy security can be very broad. This is especially true considering the many factors which can cause shortfalls in oil supplies, the different impact that disruptions and dislocations may have on oil supplies and investment and the facts that some of these disruptions may originate in consuming nations. This all means that energy security applies to the entire supply chain.

3. West Asia and Global Supply Interruptions

To focus our analysis further, let us examine the factors which mould West Asia energy security. The fact that high dependence on West Asia oil creates serious grounds for concern should come as no surprise. The region has experienced a relatively large amount of disruption; some causing large losses of supplies, for instance the Iraqi invasion of Kuwait which resulting in a cumulative loss of 420 million barrels during the period 1990–1991 (see Table 1). The region has witnessed wars, civil conflicts, invasions revolutions and terrorist acts.

[16] Horsnell P. (2000). "The Probability of Oil Market Disruption with an Emphasis on the West Asia." Working paper published by James A. Baker Institute for Public Policy, September.

Table 1.Global oil disruptions caused by events in the West Asia (1951–2004)[17]

Date of oil supply disruption	Duration (months)	Average gross shortfall (mbd)	Reason for oil supply disruption
03/1951–10/1954	44	0.7	Iranian oil fields nationalized May 1 following months of unrest and strikes in Abadan areas
1/1956–03/1957	4	2.0	Suez War
12/1966–03/1967	3	0.7	Syrian transit fee dispute
06/1967–08/1967	9	1.3	Libyan price controversy; damage to tap line
05/1970–01/1971	5	0.6	Algerian–French nationalization struggle
03/1973–05/1973	2	0.5	Unrest in Lebanon; damage to transit facilities
10/1973–03/1974	6	2.6	October Arab–Israeli War; Arab oil embargo
04/1976–05/1976	2	0.3	Civil war in Lebanon; disruption to Iraqi exports
05/1977	1	0.7	Damage to Saudi oil field
11/1978–04/1979	6	3.5	Iranian Revolution
10/1980–12/1980	3	3.3	Outbreak of Iran–Iraq war
1990–1991		420 (a Cumulative effect)	Persian Gulf Crisis
03/2003–09/2004	Continuing	1.0	Iraq war and continued unrest

The West Asia and in particular the Persian Gulf States continue to act as the main supplier of oil to global markets. In many cases the region has played the role of a swing producer, absorbing supply shocks from within and outside the region. For example, the large loss of oil caused by the Iraqi–Kuwait invasion was filled by the available spare capacity in Saudi Arabia. Recently, some Persian Gulf States have invested heavily in their upstream sector with the aim of increasing their productive capacity.[18]

If one studies more recent history, the major oil disruptions in the last decade originated from OPEC members outside the West Asia and elsewhere in the world (the main exception being the U.S invasion of Iraq in 2003, see Table 2). The region did not witness any civil unrests or strikes such as those in Venezuela, successful militant attacks on oil installations as in Nigeria or tensed relations with importing countries as in the case of Russia.

Furthermore, the region did not experience any major disruption due to technical failures, hurricanes or weather related events. But still there is unease and sometimes a sense of mistrust in relying on West Asia oil.[19] The oil security agenda is still influenced by the events surrounding the 1973 oil shock and the embargo imposed by Arab countries. This in spite of the facts, that the oil cuts were for a short duration, and that this event represents an exception rather than the rule in the long history of oil.

Table 2 demonstrates how, during the last few years, general strikes and oil workers' strikes were responsible for many disruptions in the oil supply chain. Oil strikes in oil-exporting countries may have adverse consequences on long-term productive capacity. Many observers note that Venezuela, for example, has never been able to restore its productive capacity to its pre-strike level.

[17] Sources: Horsnell P. 2000. The Probability of Oil Market Disruption with an Emphasis on the Middle East. Working paper published by James A. Baker Institute for Public Policy, September.

[18] Fattouh B. (2007), "OPEC Pricing Power: The Need for a New Perspective. In The New Energy Paradigm". Oxford: Oxford University Press.

[19] Ibid.

Table 2.Global oil disruptions 2000–2007[20]

Apr 5, 2002	Thousands of workers at Venezuelan state oil company PdVSA stay at home, close gates of facilities and engage in protests.
Apr 8, 2002	Iraq announces that it will halt its "oil-for-food" exports for 30 days as a gesture of support for the Palestinians' struggle with Israel.
Apr 9, 2002	A general strike begins in Venezuela, shutting down many stores and factories and almost halting oil production, refining and export terminals.
Oct 3, 2002	Hurricane Lili makes landfall on the US Gulf coast after passing through offshore hydrocarbon production areas and the Louisiana Offshore Oil Port (LOOP). Nearly all offshore production (about 1.5 mbd of oil production) as well as some onshore refineries are shut down.
Oct 6, 2002	A French oil tanker chartered by Malaysian state oil company Petronas is attacked off the coast of Yemen, seriously damaging the ship and killing one crew member. The VLCC, with about 400 000 barrels of oil aboard, catches fire.
Mar 19, 2003	Military action in Iraq commences with a bombing raid and missile attack on targets in the Iraqi capital of Baghdad.
Dec 2, 2003	Business and labor groups in Venezuela, including employees of state-oil company PdVSA, begin a strike in order to obtain an early referendum on the rule of Venezuelan President Hugo Chávez.
Mar 23, 2004	Outbreaks of violence between soldiers and militants of various ethnic groups in the Niger Delta region of Nigeria prompt three major oil companies operating in the region to shut operations in the area, totalling about 800000 bbl/d.
Jun 12, 2004	Two explosions damage the Kirkuk-Ceyhan oil pipeline, in what is later determined to be an act of sabotage. Several other Iraqi pipelines are damaged in acts of sabotage throughout the month
Aug 15, 2004	Iraq's crucial northern oil pipeline from Kirkuk to the Turkish port of Ceyhan is attacked, stopping flows on the line just two days after it reopened for the first time since the war.
Apr 21,2004	A car bomb explodes outside a police building in Riyadh, Saudi Arabia, marking the first major attack by militants on governmental targets in the Kingdom.
May 30, 2004	Saudi militants attack a complex in Khobar, Saudi Arabia, housing foreign workers.
Sep 14, 2004	Hurricane Ivan forces Shell Oil Co., ChevronTexaco, ExxonMobil and Total to shut some hundreds of thousands of barrels per day of Gulf of Mexico oil production as the companies evacuate more than 3000 workers from the offshore platforms.
Nov 2, 2004	Saboteurs mount a large attack on Iraq's oil infrastructure by blowing up three pipelines in the north, halting exports at the Turkish port of Ceyhan.
Dec 5, 2004	Around 300 unarmed Nigerian villagers – including women and children – from the Kula community in Rivers State in the Southern Niger Delta, seize three oil flow stations operated by multinational oil companies Shell and ChevronTexaco, shutting in 100 000 barrels per day (bbl/d) of production for one week.
Mar 1, 2005	Iraq closes its northern crude oil export pipeline indefinitely due to sabotage concerns. The 600 000 bbl/d-pipeline, which runs from the city of Kirkuk to the Mediterranean port of Ceyhan was the target of over 15 attacks from January 2005.

[20] Source: EIA

Mar 24, 2005	An explosion at BP's Texas City oil refinery kills 15 people and injures more than 70.
May 20, 2005	A strike in France shuts down five of six oil refineries operated by international oil major Total.
Jul 5, 2005	Tropical storm Cindy disrupts oil and natural gas production in the US Gulf of Mexico (GOM) region. The storm shuts-in oil and gas platforms and forces the closure of the Louisiana Offshore Oil Port, the largest US oil import terminal. Cindy also causes some oil refineries in the region to cease operations.
Jul 8, 2005	A strike by local workers at Angola's Block 0 offshore oil project shuts-in almost all production at the project.
Jul 11, 2005	Hurricane Dennis causes serious damage to the Thunder Horse project, a semi-submersible platform under development by BP.
Jul 19, 2005	Hurricane Emily shuts in most of Mexico's offshore oil production in the Gulf of Mexico region.
Aug 5, 2005	BP shuts-in production at its 120000 bbl/d Shiehallion oil field in the UK Sector of the North Sea due to a fire in the staff facilities. The fire is representative of the kinds of problems that impair North Sea oil production in early August 2005, with unplanned outages cutting production from the area by more than 250000 bbl/d at one point.
Aug 15, 2005	Protests in Ecuador's north Asia, oil-producing provinces shut in much of the country's crude oil production.
Aug 28, 2005	Hurricane Katrina strikes the US Gulf of Mexico (GOM) region near New Orleans, severely impacting oil and natural gas production there.
Sept 24, 2005	Hurricane Rita makes landfall along the US Gulf Coast. Energy companies operating in the region had shut in almost all oil and natural gas production in anticipation of the storm. Refiners also had shut in over 3.9 mbd of refining capacity, which, along with the refining capacity already shut down due to damage caused by Hurricane Katrina, represents over one-quarter of total US capacity.
Sept 27, 2005	A strike at the largest oil refinery in France, Total's facility at Gonfreville, shuts-in 343000 bbl/d of refining capacity in that country.
Oct 21, 2005	A strike by workers at Nigeria's Brass River crude oil export terminal shuts operations at the facility for two days.
Oct 31, 2005	Workers at Royal Dutch Shell's Pernis refinery begin a phased shutdown of the facility, as part of a labour dispute with the company.
Dec 14, 2005	Oil tankers transiting the Bosporus Straits face delays of 19 days, more than twice the delay faced at the same time in the previous year. Poor weather and increased tanker traffic cause the increase.
Dec 20, 2005	Militants in Nigeria's Niger Delta bomb a crude oil pipeline in two different locations. The bombings kill sixteen people and start a large fire. As a result of the incident, Royal Dutch Shell shuts in 180000 bbl/d of crude oil production and declares force majeure on its crude oil exports from the country
Jan 11,2006	A series of incidents in Nigeria leads to the shutting in of 220000 bbl/d of crude oil production.

Feb 9, 2006	Protesters in Ecuador shut down all crude oil production operated by state-owned Petroecuador.
Feb 21, 2006	Royal Dutch Shell extends the force majeure on its crude oil exports from Nigeria. The company has shut in 455 000 bbl/d of crude oil production in the country due to conflict in the oil-producing Niger Delta region.
Feb 24, 2006	Militants in Saudi Arabia try to attack the Abqaiq oil processing terminal with three truck bombs. Security forces are able to repel the attackers, before they penetrate into the core of the facility.
Mar 2, 2006	Workers at the Prudhoe Bay oil field in Alaska discover a leak in a pipeline, forcing field operator BP to shut-in 100 000 bbl/d of crude oil production.
Apr 30, 2006	A fire at the Impianti Nord refinery in Sicily, Italy closes the 160 000 bbl/d facility.
Jun 1, 2006	A fire damages the Khor al-Amaya oil export terminal in Iraq, forcing it to close.
Jun 21, 2006	Oil services workers in Norway strike, which has a limited impact on oil production.
Jul 19, 2006	Renewed attacks on Iraq's northern pipeline block the country's crude oil exports from its Kirkuk fields, which are routed through Ceyhan, Turkey.
Jul 24, 2006	A leak at a Royal Dutch Shell-operated pipeline in Nigeria shuts in 180 000 bbl/d of crude oil production, forcing the company to declare force majeureon its Bonny Light August loadings.
Aug7, 2006	UK-based oil and gas major BP announces that it will shut in production at the 400 000 bbl/d Prudhoe Bay oil field in Alaska, following the discovery of leaks on a transit pipeline feeding the main Trans-Alaska Pipeline System (TAPS).
Nov 27, 2006	A mortar attack strikes one of two crude oil processing plants at Iraq's Kirkuk field, cutting output at the field to 100 000 bbl/d from 300 000 bbl/d.
Jan 3, 2007	Russia halts crude oil exports to Belarus through the Druzhba pipeline after Belarus demands a $6 per barrel tax to transit Russian oil.

Although disruptions may occur at any segment of the oil supply chain due to a wide range of factors, it is the politically-driven threats to oil supplies that have dominated the energy security debate and the imagination of policy makers.[21] In this debate, the West Asia features prominently. The dependency on West Asia resources still raises a number of concerns.

First, there are fears that oil-exporting countries from the region could be hit by wars or internal conflicts. Second, there are fears that these countries may witness long periods of instability that could influence their oil industry and also could influence the oil market. Third, there are fears that terrorist networks will succeed in hitting oil installations and pipelines. Fourth, there are concerns that some countries in the region may be tempted to use the oil weapon and restrict trade routes to force importing nations to yield political concessions. And finally, there are concerns that the West may react to political developments in the West Asia by imposing sanctions on some oil exporters.[22]

4. How supply interruption affect global energy security

The consequences of a disruption in energy supplies for a global energy security specially for consuming country or region depend on several factors, including the type of fuel, the nature and size of the disruption or shortage, expectations about how long the disruption will last and the fuel-import intensity of the economy. In practice, economic vulnerability depends not just on the nature and duration of a disruption, but also on the flexibility and resilience of the economy to respond to and withstand the physical loss of supply and the higher prices that result.

As mentioned earlier, the sudden loss of even a modest volume of oil can lead to sharp increases in prices, particularly when global spare capacity is tight or when geopolitical tensions are high. A well-functioning, competitive market will reallocate supplies according to ability to pay, though macroeconomic damage may result from the increase in price. In this case, particularly where supplementary emergency measures are available, a supply disruption should not, in principle, cause a physical shortage, as price adjusts upwards to bring demand back into balance with the new, lower level of supply. Similarly, where prices are driven higher by a lack of supply capacity as demand outstrips capacity additions, more investment would normally be forthcoming, eventually driving prices back down. But there may be important time lags. Where prices are not free to adjust because of price controls or infrastructure constraints on deliverability, physical shortages can occur at local or national levels. In the case of oil, all OECD countries and many other non-member states have liberalized their oil markets, so prices are free to rise in response to a supply disruption. In these countries, the risk of physical unavailability is largely reduced to extreme events – such as weather-related catastrophes, strikes or terrorism.

The effects of a disruption in oil supplies, regardless of where it takes place and which buyers are directly affected, mainly depend on the extent of the global price response – not on whether the consuming country obtains its oil physically from the country from which supply is disrupted. Crude oil and refined products are global commodities. The prices of all crude oils are linked, via explicit formulas in term contracts or through direct competition in the spot market, to the futures or spot prices of a small number of benchmark grades. The international spot prices of refined products are closely correlated with crude oil prices. Thus, a shortfall in oil supply to one country, by driving up the price of all grades and types of oil, affects all consuming countries, regardless of whether their supplies are directly affected or not. Even in the theoretical case of a country isolated from the market by self-sufficient supply lines, the value of the oil would rise in response to an external supply disruption and that additional value would be forgone if domestic prices did not increase accordingly.

In the event of a disruption in the supply of natural gas, physical shortages can occur because of inflexible infrastructure, price controls or rigidities in supply contracts to end users (even in

[21] Fattouh B. (2007), "How Secure Are West Asia Supply", Oxford: Oxford University Press.

[22] Ibid.

competitive markets). In such circumstances, gas use must be reduced by administrative means. In many OECD countries, gas distribution companies are tasked by the authorities with determining how to allocate scarce supplies during a supply emergency.

The impact of a disruption in the supply of gas, in contrast with oil, does depend to a large extent on the source of the gas. Gas-pipeline infrastructure is inflexible, so that a loss of supply through a particular pipeline system cannot always be made good by supplies from other sources. LNG supply is more flexible, as it may be possible to replace the loss of supply from one source by output from another, as has happened in several recent cases. The share of LNG in world gas trade is set to rise strongly over the projection period, particularly to supply OECD countries, which will contribute to more flexibility in gas supply. But, in practice, there may not be enough spare liquefaction and shipping capacity immediately available to compensate for a large supply disruption. In addition, most LNG is at a present sold under long-term contracts, with rigid clauses covering delivery, though many new projects to come on stream in the next few years have more flexible terms.

5. The energy security policies of China and India

China and India have differing perceptions and concerns related to the security of their energy supplies. There are nonetheless important similarities between the two countries' energy-security policies. The policy focus in both

countries is on oil, reflecting increasing imports in recent years and the expectation that this trend will continue in the medium term. Chinese and Indian leaders are worried that growing dependence on imported oil will bring foreign-policy and economic pressures that might threaten national security and social and political stability. Those concerns have grown since the events of 11 September 2001 and the US-led military intervention in Iraq in 2003.[23] Both countries have stepped up their military and naval capabilities, but recognize that they will continue to rely to a large degree on the United States for protection of international sea lanes in West Asia and East Asia for many years to come.

Consequently, China and India are pursuing policies to alleviate the increase in import dependence, diversify the sources and routes of imported oil and prepare for supply disruptions.[24] Those policies are intended to minimize the vulnerability of oil supply to external events and influences, and to limit the economic damage wrought by a supply disruption and subsequent price shock.

Table 3, summarized the two countries' principal policies and measures in place or planned. The development of indigenous resources, particularly coal, has always been the primary thrust of both countries' policies to minimize the need to import energy. Increasing emphasis is now being given to energy efficiency and conservation.

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[23] IEA (International Energy Agency), Energy Security and Climate Policy: Assessing Interactions, 2007
[24] Ibid

Table 3.Main Policies of China and India for energy security[25]

	China	India
	Energy intensity target set for all provinces.	Establishment of the Bureau of Energy Efficiency in 2001 to co-ordinate policies and programs.
Energy savings	Fuel economy standards (2005) and taxes based on weight of the cars enacted (2006). Increased export taxes for energy-intensive products (2006). Closure of inefficient heavy industry and power plants. Domestic oil prices lifted to better reflect international prices (though subsidies remain) and transport fuel tax proposed.	Renovation and modernization of power stations and electricity networks leading to increased efficiency and reduced losses. Introduction of mandatory appliance labeling and energy efficiency standards for buildings.
Diversification of fuels	Development of natural gas market, including recent completion of West-East pipeline and an LNG terminal (two new terminals are under construction). Support to renewables, including hydropower, biofuels, solar and wind, and nuclear power (10 existing reactors, two under construction and others planned). Research, development and deployment of clean coal, coal-to-liquids and biofuel technologies.	Policy to increase use of hydropower, nuclear, wind, solar and biomass in power generation. Promotion of biofuels (ethanol and biodiesel) and mandatory use of CNG for public vehicles in several cities. Iran-Pakistan-India gas pipeline, by passing the Straits of Hormuz, proposed. Solar water heating systems and solar air heating/steam generating systems for community cooking promoted. Coal-bed methane production started in 2007.
Diversification of oil supply sources/routes	Increased purchases of oil from Africa, Russia and Central Asia, reducing share of West Asia.	New Exploration Licensing Policy attracting growing interest from foreign companies, with 7th round planned for 2007.

[25] Government of India (2006), Towards Faster and More Inclusive Growth: An Approach to the 11th Five Year Plan, Planning Commission, Government of India, New Delhi., OECD (2007), Economic Survey of India, OECD, Paris., Poddar, Tushar and Eva Yi (2007), India's Rising Growth Potential, Global Economics Paper No. 152, Goldman Sachs Economic Research, New York., Central Electricity Authority (2006), All India Electricity Statistics: General Review 2006, Government of India, New Delhi., Planning Commission (2006), Integrated Energy Policy: Report of the Expert Committee, Planning Commission, New Delhi., China Medium and Long Term Energy Conservation Plan, 2004, NDRC, Beijing., Tsinghua University (2007), Annual Report on China Building Energy Efficiency, China Architecture and Building Press, Beijing., National Bureau of Statistics (NBS), China Statistical Yearbook, various years. National Development and Reform Commission (NDRC) (2007a), Policy of Natural Gas Utilisation, NDRC, Beijing., Merrill Lynch (2007), China and India: A Dash for Gas, Industry Over view, Merrill Lynch, Hong Kong., IEA (International Energy Agency), World Energy Outlook, 2008

	Construction of Kazakhstan-China Oil Pipeline (eastern leg completed in 2005). Russia-China pipeline proposed. Opening-up of onshore production to foreign investment.	Possible shift to an open acreage licensing policy in the coming years.
Equity oil overseas acquisitions	Government facilitates foreign investment by state companies through financial support and energy diplomacy (sometimes involving development aid) under "going-out" policy. Equity oil production is about 600 kb/d in 2006.	Hydrocarbon Vision 2025 encourages overseas equity investment, backed by government's energy diplomacy. Production is currently about 100 kb/d. Rapid development of ONGC Videsh's assets portfolio.
Strategic oil reserves	Four sites with a combined storage capacity of close to 100 million barrels (about 27 days of current net imports) under construction, to be completed by 2008. Two additional phases, involving 200 mb each, are planned.	Construction of a Strategic Petroleum Reserve with capacity of 36 mb (19 days of current net imports) due to start in 2007, with completion expected in 2012. In two additional phases, stocks are due to rise to 110 mb.

In China, oil security has emerged as a central policy issue and is increasingly affecting domestic economic and foreign policy. The government's response to rising imports in the 1990s was focused on the supply side, characterized by efforts to diversify the geographic sources of oil and physical supply routes, aimed at reducing the heavy reliance on maritime shipping through the Indonesian archipelago.[26] A particular concern was – and remains – the threat of an oil blockade in the event of a military conflict over Chinese Taipei.[27] The share of China's oil supplied by sea from West Asian countries has been reduced in recent years, thanks to increased purchases from Africa, Central Asia and Russia, though this trend is set to reverse in the coming years.[28] Proportionately more oil is now supplied overland, by pipeline from Kazakhstan and by rail and road from Russia, helping to alleviate the risk of disruptions to seaborne transportation.

Pipelines from Russia and across Myanmar have also been proposed. China is stepping up its military and naval protection of maritime routes in Asia, including expanding bases, ports and patrols. China is also building strategic oil-storage facilities and, in a first phase, has begun to fill a stockpile of up to 100 million barrels of oil by 2008; 400 Mb is due to be added in two later phases.[29]

Another facet of China's official energy-security policy is the acquisition of equity stakes in exploration and production assets overseas. This "going-out" policy was initiated in the early 1990s.[30] It was motivated both by the perceived need to secure oil supplies to meet growing import needs and by the ambition of the state companies to increase their reserves, diversify their activities and increase profits, with the ultimate aim of creating internationally competitive world-scale businesses. Today, China's national companies control about 600

[26] Downs, E. (2006), Energy Security Series: China, Brookings Institute, Washington D.C.
[27] Rosen, D. and T. Houser (2007), China Energy: A Guide for the Perplexed, Center for Strategic and International Studies/Peterson Institute for International Economics, Washington D.C.
[28] Ibid
[29] Ibid
[30] Ibid

kb/d of oil production overseas and India's about 100 kb/d. China's overseas equity oil output could reach 1.1 mb/d in 2015.[31] Neither the Chinese government nor the companies have drawn up a comprehensive national plan for acquiring overseas assets: the companies – often in competition with one another – take decisions about acquisitions and then obtain state approval. It is doubtful whether Chinese equity oil investments contribute materially to improving the country's energy security or whether this objective still drives continuing overseas expansion by Chinese oil firms. The volume of overseas equity oil is small relative to the country's oil demand and is, in any case, mostly sold on the international market rather than physically shipped to China.

In recent years, China has placed more emphasis on demand-side measures to curb the growth in oil imports. Stringent vehicle fuel economy standards came into effect in 2005 and a new car-tax regime, that penalizes large cars, was introduced in 2006.[32] A new road-fuel tax, which could significantly lower fuel demand in the longer term, is still under consideration. Other policies, including the development of the natural gas market and nuclear power capacity, are aimed at diversifying the fuel mix in buildings and in power generation.

India has adopted similar measures to reduce its vulnerability to oil supply disruptions.[33] Supply-side measures include the introduction in 1998 of a new exploration licensing policy aimed at encouraging investment in the upstream oil and gas sectors. There have been eight licensing rounds under the new rules, though interest from the major international oil companies has been limited. The government has decided to build a strategic petroleum reserve with a capacity of 15 million tonnes, with a first phase of 5 million tonnes or around 19 days of net imports at current rates. Construction was due to start in 2007.[34]

The Indian government has also encouraged state-owned companies to acquire oil assets overseas, though to a lesser degree than the Chinese government. The government is

promoting the development of natural gas, clean coal technology, nuclear power and renewables to diversify energy use away from oil in both non-transport and transport uses. Several measures have been introduced to promote more efficient energy use and reduce waste, including the phasing-out of state subsidies on all petroleum products, except kerosene and liquefied petroleum gas, and higher taxes on transport fuels.[35]

For both China and India, energy diplomacy, involving the development of a broad network of bilateral relationships with producer countries is considered an important element of energy-security strategy. Diplomatic efforts have been focused on West Asia and Africa. Policy makers in both countries believe that, in an oil or gas crisis, relationships with producers will count for more than just ownership of assets or ability to pay.

Energy diplomacy is intended to help improve security by assisting domestic companies to win deals involving equity oil, ensuring privileged treatment in the event of a supply disruption and attracting inward investment and technology. In particular, encouraging investment from producer countries in China's and India's downstream sector is seen as a way of ensuring that the producers have a mutual interest in maintaining the flow of hydrocarbons.

High-level diplomacy is also considered necessary to help national companies counter the dominant position of the major international oil companies

[31] Paik, K-W., V. Marcel, G. Lahn, J. V. Mitchell and E. Adylov (2007), Trends in Asian NOC Investment Abroad, Working Background Paper: March, Royal Institute of International Affairs, London.

[32] Rosen, D. and T. Houser (2007), China Energy: A Guide for the Perplexed, Center for Strategic and International Studies/Peterson Institute for International Economics, Washington D.C.

[33] Madan, T. (2006), Energy Security Series: India, Brookings Institute, Washington D.C

[34] Ibid.

[35] Ibid.

in securing access to resources, even if equity investments do not necessarily contribute to energy security.

The Chinese and Indian governments support their national companies through summit meetings in oil-producing states, direct involvement in project negotiations and energy co-operation agreements. The Chinese government also provides direct and indirect support to its national oil companies through loans, sometimes at below-market interest rates.

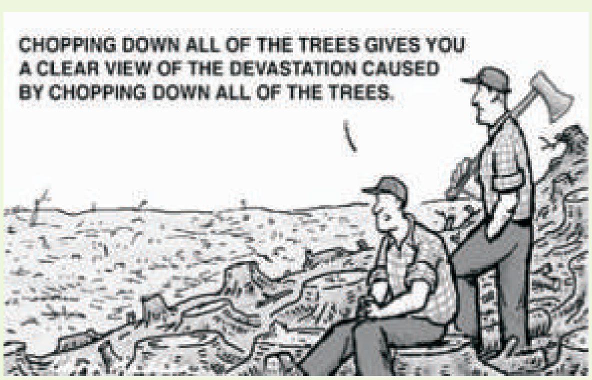
6. Conclusion

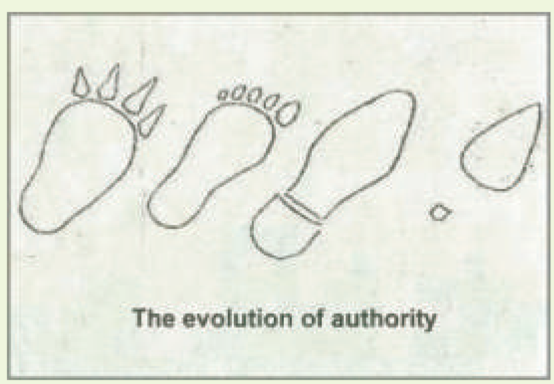
Since oil embargo in 1973, the energy security system has evolved slowly and is based on a number of components. Firstly, is the security of crude oil. Secondly, coordination on sharing oil supplies and oil stocks in cases of emergency and disruption. Thirdly, pursuing policies of energy conservation and promoting efficiency measures. Fourthly, monitoring and analyzing the oil market. Fifthly, increased transparency in the oil market data. And, lastly, engaging in constructive dialogue with oil producers.

There are different reasons why oil consuming countries may be concerned over the security of supplies especially in the West Asia. They constantly worry that the security of supply is threatened when domestic supplies decrease, imports increase, bottlenecks in trade routes emerge, competition with other countries to access reserves is amplified, and the ability to diversify and produce sustainable energies is dampened. Secondly, increasing concentration of oil and gas imports from West Asia with -combined the perceived political instability in this region, the strategic interests of the US, China, and EU- present the second set of concerns in the consuming countries. Reserves gain influence in the international energy equations only when converted into production capacity and physically capable of supplying markets.

Producers need a steady flow of revenues for their economic development. And consumers need stability and predictability in oil prices. OPEC countries need to maintain oil prices within its price band to be able to ensure a secure stream of supplies to international markets. The joint–responsibility of maintaining energy security for consumers as well as producers not only remove the uncertainty but through cooperation, provides a safe ground for capacity building to ensure the security of supply, sustainable development and investment in non-oil and gas sectors of the economy.

The reliance of all consuming countries on oil and gas imports will grow markedly in the absence of new policies in major countries to curb demand. Ensuring reliable and affordable supply will be a formidable challenge. China's and India's growing participation in international trade increases the importance of their contribution to collective efforts to enhance global energy security. The more effective are their policies to avoid or handle a supply emergency, the more other consuming countries stand to benefit. Equally, efforts by other consuming countries bring important benefits to China and India.





Indian Energy Security Campaign Rolls Ahead

V. Gayathri Devi

For a country that aspires to be on economic growth trajectory and emerge as the new power house globally, India has identified over years that achieving energy security is the key. Resources, fuel, equipment and technology apart from tapped and untapped energy assets are five components on which India's energy security campaign unveiled way back in 2000 hinges on. This campaign has been spread across energy portfolio including oil, gas, coal, shale gas, nuclear power, new and renewable energy resources apart from areas like tapping energy trapped deep under water through carbon sequestration technologies.

Insulating the Indian economy from external energy markets shocks and achieving full security have been the bullwark of the formulation put forth by policymakers over last one decade. Indian government has begun this campaign to attain energy security with a firm plan. It has taken some firms steps, but lot more needs to be done. The trillion dollar plus Indian economy is one of the fastest growing ones just next to China. But, in the journey towards attaining energy security for its 1.2 billion people, India will have to put this campaign on fast track to cater to expanding manufacturing sector, huge infrastructure foray, widening farm canvass and sustain over 20 per cent annual growth in merchandise exports apart from huge hunger for energy on domestic front. In last few months, Petroleum Minister Murli Deora's flurry of visits to Nigeria, Angola, Uganda, Sudan, Saudi Arabia and Venezuela point to the urgency and seriousness with which the UPA government has taken the energy security campaign. This is an endeavour to seek better energy deals for the country's 1.2 billion people.

"We are constantly looking to acquire assets up to $2 billion every year," R S Butola, Managing Director of state run OVL indicated at a recent industry conclave. Another top honcho of the oil industry, in one of his recent interaction with media in the capital, revealed that there is a new push from government's side to look aggressively for energy assets abroad. "Going abroad is part of the government's policy — diplomatic support is very, very crucial as we search for assets overseas," a news agency quoted Oil India Chairman N M Borah as having said. Per capita energy consumption in India is currently 0.4 tonnes of oil equivalent (toe) as against China's 1.5 toe and Brazil's 1.3 toe. India's per capita consumption is expected to triple to 1.22 toe by 2030 and the share of natural gas in the energy basket is also likely to grow from 9 per cent today to around 11 per cent of India's energy needs. International Energy Agency (IEA) said India's fuel demand will grow by 3.2 percent next year. The Paris-based international agency predicted that the country's fuel demand will grow by 65,000 barrels per day (BOPD) in the current year to around 3.33 million BOPD. And, in the next year it would grow by 107,000 BOPD to 3.43 million BOPD. At present, India's demand for natural gas is pegged at 170 million metric standard cubic metres a day (MMSCMD). Out of this, 142 MMSCMD is sourced from domestic fields and rest is imported. India's natural gas production from home fields is expected to touch 151 MMSCMD by 2011-12 and 186 MMSCMD by 2012-13, according to Petroleum Secretary, S Sundareshan. The Indian gas market is taking off, but will remain price sensitive, McKinsey said in a recent report. The Indian gas market has evolved steadily over the past 20 years, and with improved infrastructure, local discoveries and moderate price levels has begun to grow rapidly, McKinsey said.

By 2015, the Indian gas market is likely to be as large as that of Japan. At present, gas demand in Japan is 258 MMSCMD, followed by China's 222 MMSCMD. India's current gas demand is around 113 MMSCMD. By 2015, this demand is expected to catapult to 280-320 MMSCMD, while China's demand will hit 452 MMSCMD. "India is likely to have a $50 billion gas industry by 2015 with profit pool of $30 billion and incremental investments of $40-50 billion," McKinsey said. It is not just the oil and gas assets India has been looking to expand. Unless there is enough power generating capacity to put the fuel to use, supply of uninterrupted and stable electricity to the manufacturing and farm sectors will remain a pipe dream. Today, the country has an installed power capacity of 160,000 mega watts (MW). But, the peaking deficit of close to 14 per cent reflects the gigantic task that needs to be undertaken to meet the expanding demand across sectors. Planning Commission had projected a power capacity addition of 78,577 MW annually during eleventh plan that comes to an end by 2012. During the mid-term review of the plan by Prime Minister Manmohan Singh recently, the capacity addition has been lowered to 62,000 MW new capacities would be installed. This, however, does not include the 12,000 MW captive consumption capacities that are under various stages of execution. Below target green field capacities addition over last four plans has been an issue that policy makers have been grappling with. And, this time round also, the situation is no different given the slippages staring in the face. This has not prevented Yojana Bhavan from considering an ambitious 100,000 MW fresh capacities during twelfth plan, i.e. 2012-17. Only initial estimates for the next plan are available that may be further fine tuned as the initial draft of twelfth plan is made public in few months from now. On the other hand, to sharpen the government's energy security campaign, Prime Minister Shri Manmohan Singh recently constituted a Ministers' panel headed by Finance Minister, Shri Pranab Mukherjee. This group has been given the mandate to draw up action plans to acquire coal, oil, gas and uranium assets overseas. First step that was mooted by this venerable group is to set up a dedicate sovereign fund for expanding India's energy footprint globally. The proposed fund will ultimately be carved out by dipping into $250 billion foreign reserves. Already, most countries have such

sovereign wealth funds to support corporate mergers and acquisitions across sectors with focus on energy assets acqusition. India is the only BRIC nation that does not have a sovereign wealth fund. China, Singapore, Saudi Arabia, Norway, Kuwait and Russia are among top countries that have large wealth funds to make investment abroad. Today, the foreign exchange reserves are comfortable to support this idea of a sovereign fund though still a consensus is yet to be evolved in top echleons of power. India's journey on balance of payments and foreign exchange reserves has been long and arduous given early 1990s experience of forcing minority government of the day to pledge gold and invite public condemnation. India has walked away from a distressed condition. In 1991 it had to pledge 67 tonnes of gold with Bank of England and Bank of Switzerland to support its crude imports. With the wheel coming full circle, in 2009, it bought 200 tonnes of the precious metal from International Monetary Fund (IMF). As the debate on setting up a sovereign fund continues, Chinese companies spent $ 32 billion last year to buy oil, coal and metals assets outside their country. China founded its major sovereign wealth fund – "China Investment Corporation (CIC)", – in 2007 with an initial corpus of $200 billion. CIC is one of the largest sovereign wealth funds in the world. India did not seal any major oil and gas deal overseas. On the other hand, China brought under its kitty assets up to the tune of $12.5 billion only in the oil and gas space. Apart from a sovereign wealth fund, industry experts feel that India's quest energy assets aboard should be backed by a more diplomatic initiative. For instance, in 2005, China National Petroleum Corporation

(CNPC) pipped India to acquire PetroKazakhstan by paying $4.18 billion. It was biggest hydrocarbon deal of the year and India was almost at the final stages of achieving it. Former Petroleum Minister of India Shri Mani Shankar Aiyar told media, "…goalposts were changed after the game began." Similarly, in the same year, CNPC again left behind ONGC while acquiring EnCana Corporation in Ecuador by paying $1.42 billion. Gideon Lo, an energy analyst at DBS Vickers (Hong Kong) has commented, "One of the advantages the big Chinese oil companies have is government support—it's an open secret." "The government establishes high-level contacts with oil producing countries. Once this is done, the oil companies can come in and negotiate," Lo told Bloomberg in June 2010. Chinese companies have also the advantage of stronger Yuan. According to The People's Bank of China forecast in June, it will allow Yuan to move even higher though there has been pressure on Beijing internationally to revalue its currency. India has just began this Chinese trend of 'more than just the deal attitude.' In 2005, the same year when it lost two important deals to China, reached an agreement with Nigeria to spend close to $ 6 billion for the country. The funds would be utilised for developing infrastructure such as roads, ports and railway lines. In return, Nigeria signed a deal for supply of 600,000 barrels oil per day to India for 25 years. "Chinese and Indian companies are getting into a competitive field and that is driving up asset prices," Neil Beveridge, an analyst at Sanford C. Bernstein Ltd in Hong Kong was quoted as saying by a New-Delhi based financial daily. "That is why a lot of the companies try and do government-to-government deals. We saw that in the Indian companies getting a deal in Venezuela this year," Beveridge said in the article. It is not with oil and gas assets alone. Indian government promoted a special purpose vehicle, International Coal Ventures Private Limited (ICVL) to aggressively bid and own 500 million tonnes coal reserves by 2019-20. ICVL has been floated with proposed equity base of $ 0.9 billions and debt of $ 1.8 billion funds from private equity funds and venture capitalists, among others. It is a joint venture company between blue-chip state-owned companies like SAIL, CIL, RINL, NMDC and NTPC to secure metallurgical coal and thermal coal assets in overseas territories.

One of the objectives of ICVL is also to ensure supply of imported met coal, at least 10 per cent of requirements projected by SAIL and RINL (around five million tonnes per annum), from assets overseas as medium term target to be achieved by 2011-12. Apart from coal, oil and gas foray, a new front opened by India in its energy security campaign is nuclear energy with signing of the civil nuclear energy pact with US two years back. India has plans to generate 20,000 mw by 2020 power using nuclear fuel, technology and equipment. It is expected to reach 63,000 MW by 2032. India aims to generate 25 per cent of its electricity demand from nuclear power by 2050.

South Korean President Lee Myung-bak, in his visit to India early this year, expressed his country's urge to co-operate with India on nuclear sector. South Korea is one of the members in Nuclear Suppliers Group. The country extended unqualified supported to India at NSG in 2008. Earlier last month, Shri Manmohan Singh signed nuclear cooperation agreement with Canada during the last G20 conclave. According to media reports, the agreement aims to create an enabling environment that will permit members of Canada's nuclear industry to cooperate with designated civilian nuclear installations under International Atomic Energy Agency (IAEA) safeguards in India. Similarly, India has initiated partnership in the nuclear sector with several other countries as part of its energy security campaign. It includes countries like USA, Argentina, Mongolia, Namibia, Kazakhstan, Russia, France and the UK that can fuel the nuclear energy industry in India. ends

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Capacity Enhancement of Kenya Pipeline: An Unforgettable Experience

Sudipta K Chakravarty Dy. C.E (Pipeline)
Prankush Bujar Barauh S.E (Pipeline Fields)

May 2008 was an exciting month for both of us as we were venturing into an unknown land called Kenya, quite unknown to both of us, as we had heard of it only in maps and in school geography. It was more exciting as we were on a special assignment to Kenya as consultants for the Kenya Pipeline Company for capacity augmentation of the 14" OD product pipeline from the present rate of 440kl/hr to 880kl/hr.

Our journey started on the 18th of May from Mumbai early morning by Ethiopian Airlines. After a brief halt in Addis Ababa we reached Nairobi in the afternoon the same day. We were happy to see two of our colleagues at the airport who had come to receive us.

Next day on a schedule visit to the Kenya Pipeline corporate office we were introduced to Mr Jabes Manyala the Chief Technical Officer of Kenya Pipeline Company and also the Project Head. We were a part of the team from Petroleum India International (PII) who were chosen as the Project Management Consultant for this enhancement project. China Pipeline Petroleum Bureau (CPP) was the EPC for this project.

Kenya Pipeline Company maintains a wide network of product pipelines in Kenya. The starting point of this pipeline is the port city of Mombasa up to Nairobi which is called Line-1. The length of this pipeline is 453kms and is 14 inches in diameter. The hydraulic gradient of this pipeline is 1600 meters in Nairobi and on the way there are four pumping stations. From Nairobi the pipeline traverses to Nakuru high on the Rift Mountains and from here there is a diversion to Kisumu by way of a 6 inch nominal bore pipeline and another to Eldoret which is again an 8 inch nominal bore pipeline. From Eldoret the fuel is supplied to countries like Uganda, Rwanda, Burundi and Eastern Congo by means of road transportation. Because of the increase in demand for the products in these countries there was this requirement of enhancing the capacity.

As per the Kenyan law 30 % of the project has to be loaded to a local Kenyan firm. As per this law PII had offloaded 30 % of this project to M/s Sapamo a local Kenyan firm which was entrusted to look after the Civil works. Also CPP had offloaded 30 % of its work to M/s Triple Eight Construction for carrying out Civil Works. The original project cost which stood at Kenyan Schillings 3.5 billion (USD 46.7million), was later enhanced to Kenyan Schillings of 4.6 billion (USD 61.3 million).

The enhancement project was to construct four new pumping stations to increase the flow rate to 880 KLS per hour. Accordingly, the new sites that were selected were in Samburu for PS2, Maniyani for PS4, Makindu for PS6 and Khonza for PS8. The original design of the pipeline that was done by NKK of Japan stated that 880 KLS per hour of pumping was possible with additional new pumping stations. For this the design exposures were left in above four places.

CPP was selected as Engineering and Procurement Contractor. All the Engineering designs were made by CPP as per the FEED analysis carried out by PII which were later certified by PII. PII also made the detailed contractual documents on behalf of the client i.e. The Kenya Pipeline Company.

By the time we reached Kenya, Civil works had already started. Basic levelling work was over and all the datum heights for the new pump stations were marked. The construction of the pump sheds and the control rooms were in full swing. On our arrival and joining the project, the piping work for the new pumps started. We were on the job as soon as we reached the work site.

Our main job was that of quality control on behalf of the client. All the piping jobs had started and now we had to match the grades of pipes, follow all the construction codes as laid down in API 31.8. The other Mechanical jobs like construction of new tanks for fire fighting system were also initiated. All these jobs were completed within a short time with all quality checks.

Viscosity and density of the petroleum products

The viscosity and density of the petroleum products being transported by the KPC Line 1 Mombasa Nairobi Product Pipeline

Table 1

Product	Density(kg/l)		Kinematic Viscosity(cSt)	
	@ 20℃	@ 22℃	@ 20℃	@ 22℃
Motor Spirit Regular (MSR)	0.7100	0.7083	0.44	0.439
Motor Spirit Premium (MSP)	0.7260	0.7244	0.55	0.549
Dual Purpose Kerosene (DPK)	0.7870	0.7855	1.80	1.797
Automotive Gas Oil (AGO)	0.8445	0.8432	2.10	2.097

The distance and elevation of the Pump Stations

Table 2

No	Pump station	Chainage (km)	Elevation (m)
1	PS14 (Booster only)	-4.28	33
2	PS1	0.00	62.00
3	PS2	55.00	290.00
4	PS3	109.609	505.00
5	PS4	172.6	585.00
6	PS5	230.833	748.00
7	PS6	282.60	1016.00
8	PS7	340.289	1190.00
9	PS8	382.30	1625.00
10	Terminal	449.00	1627.00

The main challenge now was to get the infrastructure in place as the project was lagging behind time. Time and again during the monthly review meetings it was apparent that there was a considerable delay in the project with substantial cost overrun. Also the lead items that were to be procured by KPC were not in site. The main pumps were to be supplied by M/s Ebara from Japan, the fluid coupling was also due from M/s Ebara and the main motor was to be supplied by M/s Toshiba of Japan. The valves were to be supplied by M/s Southern California Valves. Meanwhile orders for fire fighting system were not yet placed. All switchgears and instrumentation equipments inclusive of SCADA were in the scope of the EPC contractor M/s CPP.

We were four Engineers from PII, two of us from OIL and the other two from BRPL. All the four of us were Mechanical Engineers, and it was with considerable difficulty that we managed the Civil works with all out efforts and got them completed in good time with the help of supervisors from Sapamo and Triple Eight Constructions.

Time was flying fast with slow progress in Civil works. Meanwhile the site of the KPC helicopter was very common carrying the chairman of KPC Mr George Okungo. He would always meet us to take stock of the situation and had very encouraging words. By mid August most of the civil jobs were over and we could now start the mechanical jobs. This was the time when our colleagues from BRPL were replaced by two other engineers from IOCL. They were of the Electrical and Instrumentation background. With this new development a lot of logistics changed

We decided to have another camp in the town of Voi which would be covering the stations of PS2 and that of PS4. The camp in Makindu would be covering that of PS6 and PS8. All the four of us were rotating in both these two camps.

KPC meanwhile was able to get all the eight pumping units to the port of Mombasa by the end of August, and the transportation to the various stations started immediately. Once in the different stations PII and CPP jointly decided to

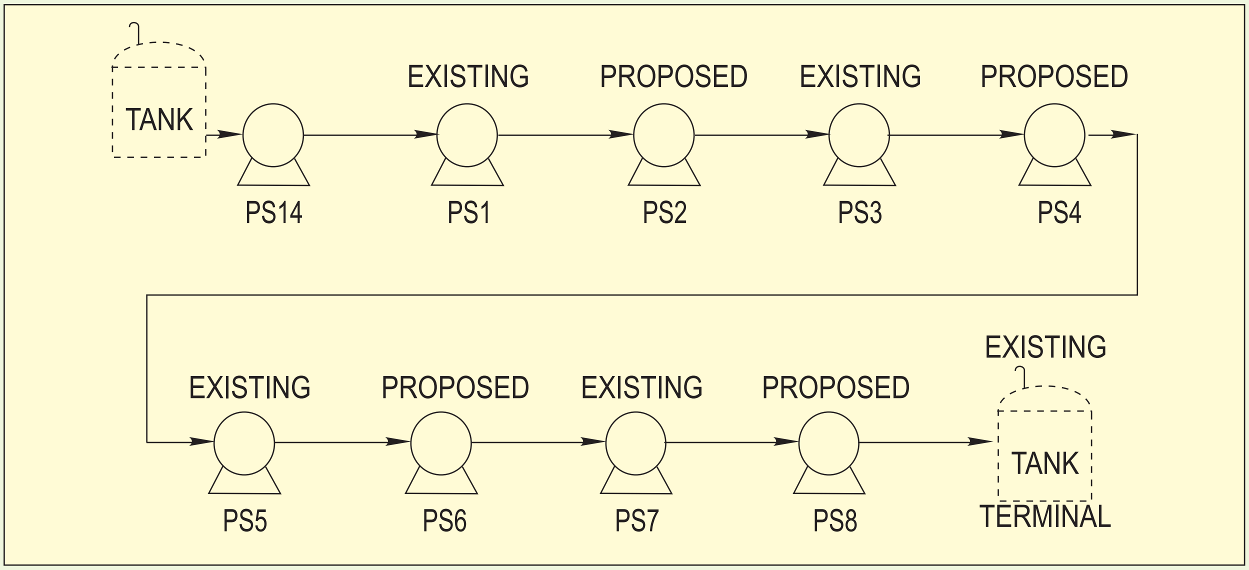


Fig. 1 : Line Diagram of KPC Pipeline (PS14 refers to Booster Pump Station at Mombasa Tank Farm)

assemble the units by themselves, but to our despair we found that the pumps had not come in single unit but as individuals, also KPC had insisted that the technicians from M/s Ebara come down and carry out the assembly process for warranty reasons. The technicians could come only after a period of 15 days from the delivery of the pump.

The actual assembly of pumps started by the second week of September. There were two Japanese technicians from M/s Ebara. The first task was that of levelling of the base plate on the pump foundations for which a particular grade of fast curing and high strength cement was required, which had to be airlifted from China. Once the base plate was set we started placing the pump, the fluid coupling and the motor along with the air blast cooler in place and started shaft alignment. This process was entirely carried out by the technicians from M/s Ebara in consultation with Engineers from PII and CPP. Slowly and painstakingly all the eight pumps were assembled in place, two in each of the Pump Station. The detailed piping along with the pump assembly is shown in the diagram above.

Once the pump sets were placed on the foundation properly aligned, levelled and grouted, we started the hydraulic piping works for the pump and the fluid couplings. The entire piping had to be flushed with a low ph value acid and then rinsed with alkali to make it free from scales and other debris that would otherwise contaminate the lube oil. Next we had to connect all the suction and delivery lines to the pumps , all the motorised valves including the emergency shutdown valves were fixed and a thorough check for the functioning of the valves both in local and in auto mode were done. Connections to the sump and the dump tank was completed and the level switch was checked.

Meanwhile the electrical and instrumentation jobs were being carried out. Both the transformers were placed to step down the voltage from 11KV to 440 volts. Power was supplied by the Kenya Power Company from its main distribution grid. Once the switch gears were placed, both the LT and the HT panels were assembled. For the security of the pipeline and to get real time data of the flow, SCADA work was taken up and completed. Next, we installed the fire fighting system. Meanwhile the communication towers for communication and telemetry was also ready. The pipeline communication was via UHF. Solar panels, to cater for power for cathodic protection was also commissioned.

It was necessary to commission the fire pumps also. This was done easily as the complete pump unit came ready for installation. The fire suppressant system in both the pump houses and the control room and the UPS room was commissioned.

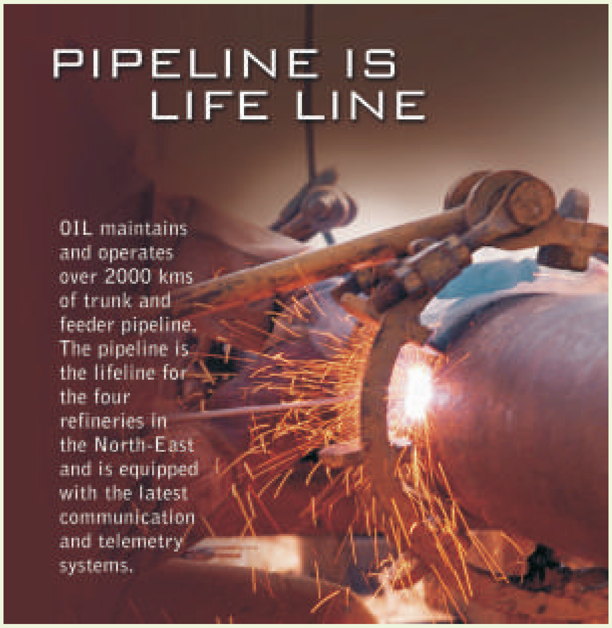
All these jobs had gone well into mid-November and now the time for testing the system had come. The main hook up job with the existing 14 inch pipeline was still there. A detailed meeting with the KPC authorities was carried out to formulate the procedure that should be followed for the tie in job in all the four stations. We started the job early morning at 6 AM taking all safety precautions. The job was carried out in all the four stations in tandem, with all the isolation valves shut and every drop of spilled oil collected. After testing the surroundings for any inflammable gases and taking all necessary precautions the pipes and fittings were welded in-situ. From next day onwards trail run was started as the system was now totally charged with liquid hydrocarbon. The pumps were first charged and then run in no load condition. Gently the scoop position of the fluid coupling was increased to put the pumps on load by closing the bypass valves. All the vital parameters in both the pumps and the motor were checked. This exercise was carried out for a week.

The newly commissioned pump stations were inaugurated on 26th of November 2008 by the President of Kenya, His Excellency Mwai Kibaki. The formal function was held in PS6 Makindu. All the dignitaries led by the President were present. Those present were the Prime Minister, the Energy Minister and all the officials from KPC, CPP and PII.

Now that the formal part was over with the President of Kenya pressing the green button, we started to stabilise the whole system. As of now the requirement was still 440kls/hr. The first task was to run the new system by bypassing the old one, for this we first tried to put PS4 in Maniyani in operation by bypassing PS3. This operation was done for around a week and was found to be successful. The remaining pump stations were taken one by one and by the end of December 2008 the entire new system was running in tandem with the old one.

With the new system in place it was time for us to bid farewell to Kenya. Our worksite took us through Tsavo National park, through the Rift Mountains; all along we were enthralled to see the natural beauty of this country. Lions, giraffes and zebras crossing the highways were a common sight in PS4 Maniyani. On some Sundays we were able to take out time to visit nearby national parks like the Amboseli on the foothills of the Kilimanjaro and the eighth wonder of the world called the Masai Mara. We were fortunate to witness the migration in Masai Mara. No visit to Kenya can be complete without going to the port and beach cities of Mombasa and Malindi, the landing place of the great Vasco Da Gama.

By the end of the first week of January we were back in India and had taken up our assignments in Oil India Ltd. For the two of us, it was a life time experience in learning new skills, meeting new people and discovering a land called Africa.



IOR/EOR – The Need of the Hour

Saloma Yomdo

Mr. Saloma Yomdo is a Petroleum Engineering graduate from the Indian School of Mines, Dhanbad. Currently Superintending Reservoir Engineer, he has been actively involved in implementing sound Reservoir Management practices in the oil and gas fields of OIL for the last 16 years. He has also presented and published technical papers in various International and National forums. An active member of the Society of Petroleum Engineers (SPE), he is an ardent music lover, a keen sports enthusiast and loves traveling.

Preamble:

Since 2003, prompt and long term oil prices had been constantly climbing to levels (average $70-80) that caught everyone by surprise. The erosion of large spare capacity in the oil chain and the perception that surging demand will eventually outpace supplies are the two key commonly cited fundamental reasons for the escalation in prices. At the heart of the argument is that global oil resources are scarce and stretched, hence the industry will struggle to deliver incremental supplies. This consensus view is underpinned by several themes: limited access to some hydrocarbon rich regions, two decades of a sluggish worldwide exploration record, poor expectation of finding new oil provinces, increasing number of mature basins that are on production, among others.

Obviously, resources and supplies are finite but to conclude that global oil resources are stretched or that the industry is or will be unable to replace production is a myth. Consider the fact that we have consumed less than 8 percent (1 trillion barrels, Tb) of the vast volumes of oil that have been discovered so far – a resource base of 9.6 Tb of conventional and 3 Tb of non-conventional crude oil. Resource base is here defined as the original oil in place (OOIP) associated with proved reserves. Assuming a conservative average overall recovery factor of 22% for the conventional proved reserves of crude oil discovered to date (2,158 Bbo) would establish a global resource base of 9.8 Tbo. Regarding the non-conventional resources, the combined OOIP for the Canadian and Orinoco oil sands, the two largest accumulations of its kind in the world, has been reliably established at 3Tbo; proved reserves of 300 billion (Bbo) correspond to a 10 percent recovery factor obtained from current and future known field projects. More resources of this type and oil shales have been quantified elsewhere. At best they are considered Contingent Resources – they have not yet been proven economically recoverable.

It is physically impossible to recover and produce all of the oil in the ground, but the industry is leaving behind as much as 78% of the oil discovered in fields that have been abandoned for whatever reason or in their late stages of depletion. Looking at the future, a tenable long term goal would be to produce 70% of the resource base of conventional oils and 30% of the non-conventional extra heavy oils. And for this, IOR (Improved Oil Recovery) / EOR (Enhanced Oil Recovery) techniques are the only alternative. What is at stake is that each percentage point improvement would unlock vast amounts of oil reserves (and production) from known reservoirs, and thus reduce the need to rely so heavily on new discoveries.

From a supply point of view, it is a fact that many of the known basins are mature (either stable or declining) whilst fewer are growing, immature or remain to be explored. There is no doubt that the incremental sources of supply will depend on the continued development of known resources, onshore Middle East and North Africa, unconventional oils, new offshore fields, and oil from new difficult basins. Although EOR production accounts for only 3% of world oil production, in the near term its potential could be significant in extending the current plateau of world onshore and mature offshore production.

IOR/EOR - Its Competitiveness:

It is a simple fact that the economics of finding new oil in most regions of the world have been

much more attractive than squeezing out the oil from aging fields. Global F&D costs were $14.42 a barrel in 2006, up a whopping 29% from the previous year. Development capex for high end deepwater fields with built-in pressure maintenance (gas and water injection) projects run between $4 and $6 per added barrel of reserves, with production costs in the $3-4 range. For non-conventional oils, development costs for recent projects in the Canadian and Orinoco oil sands range from $4.30 to $6.25 per barrel of added reserves. Production costs for cold production are $6, and $17 with steam generation.

In contrast, capex for development of EOR projects is nearly $2 per added barrel, varying somewhat with field location, well depth, number of existing wells that can be converted for injection, source of CO_2, etc. EOR production costs – those above conventional operating costs – however, can be high depending on the cost of chemicals, of steam generation which utilizes natural gas ($10 per added barrel), and the cost of CO_2, roughly $10 per added barrel in the U.S. Incentives for CO_2 capture/sequestration could further lower the infrastructure costs associated with CO_2 delivery to the oil field, particularly those offshore.

The bottom line is that EOR capex is now very competitive with F&D costs and also with reserves acquisitions which averaged $12.86 a barrel worldwide in 2006.

Global Oil Recovery Factor – A Glimpse:

Large scale injection of standard fluids like natural gas and water to supplement the natural energy of the reservoir was not the norm in the international arena until the 1960s. Even today, the large reservoirs are the ones generally selected. Moreover, not all IOR/EOR techniques are applicable to all reservoirs and reserves types. As a result considerable numbers of reservoirs, especially in medium and small fields which account for 50% of world production, have been left untouched by secondary recovery processes.

As a general rule, a recovery factor of 15-20%, corresponding to the solution gas drive mechanism, is usually the first estimate for a new discovery until other production mechanisms have been observed in the field. Case in point is the recent certification of the China NANPU9 offshore oil find; Petro China had originally assigned a recovery factor of 40% which was subsequently downgraded to 20%.

Recovery estimates for heavy oils (< 22.3^0 API) range from 10-15% for primary, 20-25% with secondary and an additional 2-6% with EOR, for a

total of 30%. Extra heavy oils (≤ 10^0 API) are unique. The very viscous ones may be unproducible by primary means and are subjected to steam injection from the onset as is the case of the Canadian oil sands. Their recovery factor is 10%. For the Orinoco, primary recovery by solution gas drive (referred to as cold production) is also 10%; an additional 10-15% is estimated with EOR processes still to be tested.

How can we get an estimate of the overall recovery factor associated with the existing world reserves of more than 40,000 oil fields each with multiple reservoirs? A baseline estimate is necessary so as to determine how much room there is for IOR and EOR growth. Several statistical estimates ranging from 27% to 35% have been mentioned in the literature. In a recent study of 11,242 fields, Laherrere obtained a worldwide average of 27%. Harper studied 9,000 fields and came up with a mean of 30%. The USGS estimates10 a worldwide recovery factor of 40%.

An overall recovery factor of 22% was reported for the U.S in 1979. It had increased to 35% by 1999 and would be about 39% today if the trend continued. The overall recovery efficiency for the North Sea province is currently 46%, the highest in the world thanks to sound IOR management applied throughout the life of the fields. Examples of top oil fields include the Statfjord field with a record recovery efficiency of 66% without EOR. Prudhoe Bay is expected to reach 47% due to early gas and water injection, followed later by miscible HC gas flooding.

A heuristic approach to estimating an overall worldwide recovery factor based on proved reserves might be useful. Proved reserves by definition encompass everything geologic and engineering that has been applied to every one of the oil fields ever discovered. Let's examine two cases, the U.S and Saudi Arabia. The U.S has a resource base of 582 Bbo, and Saudi Arabia 700 Bbo. Decline curve analysis, which is based on production from proved reserves, establishes EURs of 225 Bbo and 165 Bbo for the U.S and Saudi Arabia, respectively. The corresponding recovery factors are 39% and 23%.

Of the OPEC countries which together hold almost two-thirds of the world's reserves, Saudi Arabia's average recovery factor of 23% is in the upper echelon. Venezuela, the OPEC member with the most experience (since the 1950s) with both secondary and tertiary recovery projects, also has an overall recovery factor of 23%. Consequently, by analogy the overall recovery factor for the bulk of the world's conventional oil reserves would at best be about 20%. A simple weighted average among the major oil provinces gives an average recovery factor of 22%. This is well within the range of solution gas drive reservoirs (15-25%) with some added IOR technology effects, which are the most widespread in the world. This is the recovery value used to estimate the world's conventional oil resource base of 9.8 Tbo. The total global oil resource base would be 12.8 Tbo, including the 3 Tbo of non conventional oil. Schlumberger's estimate of global oil resources is 9-13 Tbo while the AAPG's is 9-11 Tbo.

IOR/EOR and OIL – A Success Story:

EOR's role is primarily one of extracting the last technically extractable drop of oil from the reservoir while extending the economic life of the abundant mature oil fields. Its contribution will be crucial for the continued expansion of world oil production. EOR is quite a challenge, both technologically and economically, but it is worth pursuing. Successful IOR/EOR projects are long-lived, manpower intensive, may need long lead times to do the R&D vital to the tailoring of the processes, and require constant sophisticated engineering monitoring.

The term IOR broadly covers all processes that lead to improved oil recovery including all production enhancement initiatives, well technology implementation, application of EOR processes etc. Oil India Limited depending on its requirements and suitability, has implemented a number of such IOR / EOR processes which include mainly the following-

Production Enhancement	Infill/ Step-out Drilling	Secondary Recovery	Enhanced Oil Recovery
• Optimizing artificial lift • Well stimulation • Reactivating idle wells • Changing completion strategy • De-bottlenecking facilities • Upgrading facilities	• Re-completion • Work over • Infill drilling • Step-out drilling • Deepening of wells • Second generation wells	• Water flooding • Peripheral water injection • Gas injection • Simultaneous injection of both gas and water	• Polymer flooding • Polymer flooding • Thermal • Condensate flooding • Surfactant flooding

Some of the noteworthy IOR/EOR schemes implemented in OIL's fields are summarized in the following paragraphs-

Gas Injection: Gas injection was initiated in a reservoir of Nahorkatiya oilfield in way back in 1965. Following a cumulative injection of around 25 BCM of gas in OIL's fields, gas injection was suspended from 1996 based on detailed reservoir engineering studies which indicated marginal gain in ultimate oil recovery.

Water Injection: Due to low viscosity ratio of oil and water in reservoir conditions, water injection works out to be the best IOR/EOR technique for OIL's oilfields. Having first been introduced in 1966, around 65 MM m3 of water has been injected into the reservoirs till date. In most of the reservoirs which have been subjected to fairly long duration scheme, oil recovery has been in the range of 30-50%, far exceeding the recovery estimated from primary depletion. The improvement in oil recovery factor over the primary depletion recovery for most of the reservoirs has been of the order of 10-20%. Actions are on to convert additional water injection wells and augment surface infrastructures to enhance water injection.

Polymer Flooding: Polymer flooding had been initiated in the year 1975 in an Oligocene-Miocene clastic reservoir of Nahorkatiya oilfield followed subsequently by plain water flooding, yielding encouraging result with considerable improvement in overall pressure-production behavior of the reservoir with respect to arrest of reservoir pressure decline, reduced water production and reduced producing GOR, resulting in improved oil recovery of around 42% of Original Oil-in-Place. High oil-water viscosity ratio (6:1) and adverse oil-water mobility ratio prompted initiation of polymer flooding in this reservoir adopting an inverted 7-spot pattern, which was a relatively new concept at that point of time, especially taking into account the depth of occurrence (around 2650 metres) of hydrocarbon accumulation.

MEOR: MEOR bacteria transport themselves through water and congregate in pore spaces at oil/ rock and oil/ water interfaces where they metabolize to produce organic bio-chemicals including surfactants. The effect of MEOR process causes previously immobile, unrecoverable oil to become mobile causing in improvement in oil production. Recently, MEOR process was initiated in seven wells of OIL, whereby some wells demonstrated around 40% post-job recovery. Few more wells have therefore been further identified for further implementation of this process.

Other Processes: Small scale projects of Alkaline Flooding, Miscible (Condensate) Flooding, continuous Steam Injection, have also been field tested in Digboi Oilfield. The process of Steam Injection (huff and puff) is currently being field tested as a pilot to recover heavy oil from OIL's Rajasthan field. ASP (Alkaline Surfactant Polymer) Flooding has been identified to be suitable for many reservoirs of OIL and presently being studied for implementation in Nahorkatiya oilfield.

Benefits from IOR/EOR: So far, around 223 MM m^3 of STOIIP have been subjected to the above mentioned processes, representing 25 reservoirs. It is estimated that around 22 MM m^3 oil Reserves have been added due to the above processes, of which around 16.2 MM m^3 oil have been produced so far.

Future Oil Production – Banking on IOR/EOR:

A one percent increase of global recovery efficiency would bring forth 88 Bbo of expanded conventional oil reserves, sufficient to replace three years of world production at current rates of 27 Bbo a year. The contribution of unconventional resources is not included because these are new – so far less than 7 Bbo (~0.2%) have been produced. Large-scale application of conventional EOR will impact the production profile of the world very much in the same way it has been until now – adding more production and by easing the decline of mature fields. It would throw in roughly 1 mb/d for every 10 Bbo of added reserves. The EOR capex required to develop 88 Bbo of added reserves is estimated to be about $190 billion, roughly 80% of the global E&P capex for 2006. A well-timed disposition to make outlays of this magnitude will eventually determine the impact of EOR on future global supplies. *The oil potential is there*.

JOURNEY TO PROTECT THE PROTECTORS

Hari Har Sharma

Mr. Hari Har Sharma, with more than 25 years of work experience is presently posted as, Chief Engineer (PLF) at field headquarter of Oil India Ltd (OIL) at DULIAJAN. A Mechanical Engineer by degree transforming into environmentalist, has been working on abatement of green house gas emission. Having registered a CDM project on “GHG emission reduction by recovery and utilization of flare gas” with UNFCCC is currently engaged in identifying more CDM projects. Apart from CDM activities, he has been instrumental in initiating Carbon Foot Printing activity for entire OIL operations in India. He has encouraged use of renewable energy by generating power through grid connected solar photo voltaic (SPV) system. He also encouraged the use of energy efficient lighting system in OIL.

On invitation of World Bank he presented a paper in world conference “Middle East Regional Forum on Gas Flaring Reduction and Associated Natural Gas Utilization” held during 10-11 May 2010 at the Al Bustan Palace in Muscat, Oman.

Prior to his deputation to the Ministry he was associated with monitoring the oil movement and operation of crude oil pipeline. Mr. Sharma has also worked as Sr. Engineer Mechanical Maintenance for Drilling Rigs. Before joining Oil India Ltd, he was a scholar at IIT Delhi pursuing research work in ‘Industrial Tribology and Maintenance Engineering’. He recently acquired M. Tech in (Environmental Science & Engineering) from Jamia Miliya Islamia University, New Delhi.

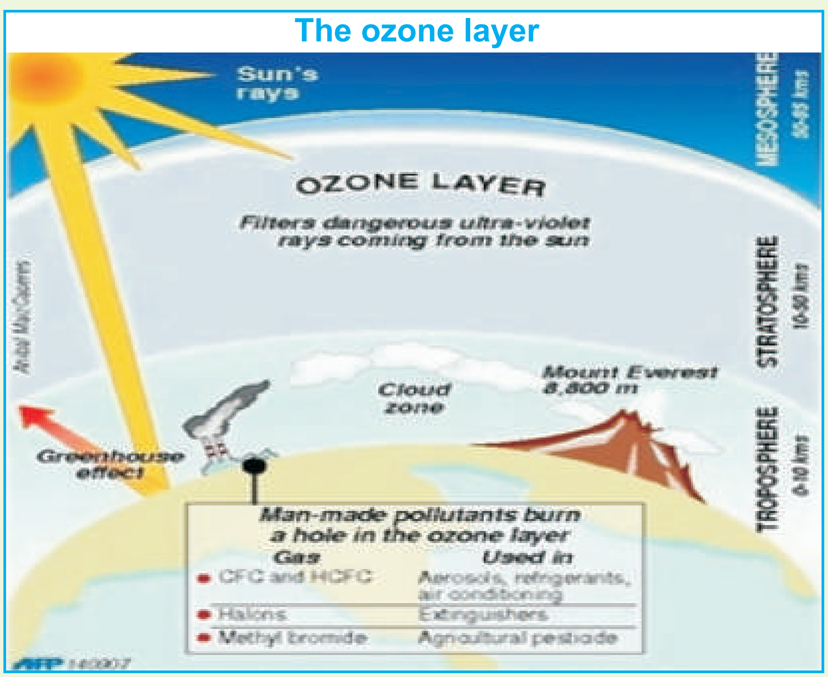
We all know that any journey is a combination of several events under continuous change. Likewise the journey of universe can also be considered as a combination of several journeys progressing without defined destination at different planets and galaxies. To reach the destination would mean an END; as it results in no further change. Our life is also a combination of change and in order to survive it needs to keep moving!

With above view, climate change is not the unusual phenomenon and global warming is a mere coincidence. We feel more concerned as the temperature rise creates problems not only for human race, but also for all flora and fauna. Therefore, efforts to arrest change through manmade actions may be seen as unnatural and even inappropriate. However, we are concerned for our survival with comforts which must get the top priority. We may like to learn the art of coexistence from the nature for living comfortably. Dynamic balancing of ozone layer in stratosphere could be taken as one of the best example where continuous change in structure of ozone molecules keeps taking place and yet ozone layer remains intact. Probably some kind of approach capable to represent balancing in consumption versus utilization and available versus remaining resources may be developed to fulfill the need of sustainable development.

There could be several schools of thought, for now let us understand our basic needs and take help from related history to understand the emerging environmental problem and its solution. In order to fix challenge of Human survival, it is necessary to ensure the support system to human kind remains intact. Unless we protect the protectors (Human Support), it is not appropriate to think of prolonged existence for all species on the planet.

OZONE IN DYNAMIC BALANCING $O_3 = O_2 + O = O_3$

Human survival is based on several resources. We get these resources as a gift from Mother Nature. Our main resources being water, air, food and material that comes from the Earth. Sun accounts for necessary energy that gives us light and acts as promoter of the required actions. Perhaps seers and wise men understood human nature (of self destruction) and were aware about facts of life and thus encouraged humans to worship all available resources and treat them with sanctity.



It appears that on recognizing the inherent characteristic of human behavior to oppose rules and change; our ancestors evolved an effective tool i.e. "Religion" to propagate the message of peaceful co-existence and treating all resources as object of worship and thus prevent misuse. No doubt that the religion factor is a powerful tool and this has been demonstrated time and again. Accordingly the ancient Gurus must have decided to term the resources responsible for human survival as GOD and this very example can be seen from the fact that the Hindus treat these life savers as God in the form of Vayu Devta (Air) , Jal Devta (Water) , Dharti Mata (Mother Earth) , Rivers are treated with respect as Mata (Mother). So river Ganges that spans across the country is worshiped as Ganga Maiya (Mother Ganga).

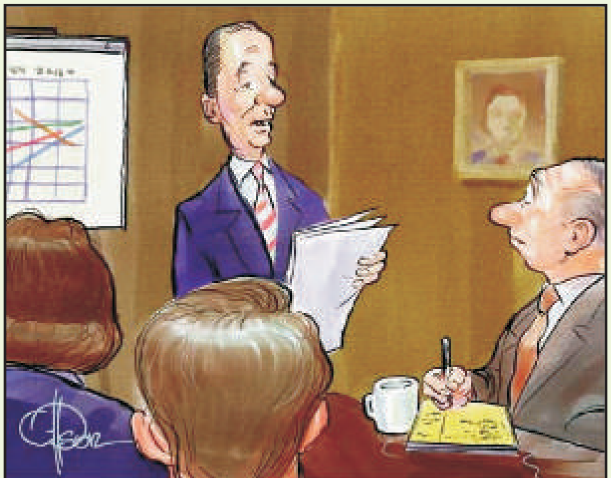
Trees are worshiped and the fact they sustain us has been known to Indians for ages.

Rivers, ponds, lakes and water wells are worshiped in India due to this religious binding and are socially accepted by one and all. It is not just trees, water bodies and earth but animals and birds too are placed into same category to be worshiped. Each God and Goddess is associated with an animal or bird and thus an object of worship for the masses.

Probably to protect or take utmost care of these resources, they found religion as a way to achieve maximum results with minimum efforts. At present when the population explosion has led to scarcity of resources and human values are changing all over the world, distance between countries have shortened, and the kind of education and preaching that was practiced in India years ago, no longer seems to be rewarding or effective. We need to explore the possibility to educate people by scientific methods providing reasoning to get their requirements fulfilled without compromising the needs of future generation. That is how the emergence of sustainable development can be addressed to and would be able to do the needful provided all concerned are ready to participate and act as required.

As expressed above, the resources being limited are required to be conserved and used judiciously. Finding an acceptable alternate to the existing material is also becoming a compelling necessity in consideration of environmental and ecological reasons. It has become necessary to educate the masses about the ecology and environmental aspects, availability of resources and harmful effect of pollution due to emission and harmful discharges.

Moreover it is realized that no human wants any increase in pollution levels instead they would like to support sustainable development. Perhaps dissemination of relevant environment related information to the stakeholders at different times and in different form is necessary so that the same could be understood and followed by majority. In our effort to create awareness among one and all, time to time, a regular feed is required to enable the people to understand, interact and adopt the good environmental practices. There could be so many methods to work upon for improvement of environmental aspects however; one can concentrate on the area of their interest.



THE BAD NEWS IS: IN A RECENT ACQUISITION FRENZY, WE PURCHASED ONE OF OUR OWN COMPANIES. THE GOOD NEWS IS: THE STOCK WENT UP.

Values Vision – From Articulation to Realization
A Unique Journey at OIL

Dr. Ajit Kumar Pattanaik
Samir Kumar Dutta
Mool Chand Nihalani
Rajkamal Kotoki.

"Every kind of peaceful cooperation among men is primarily based on mutual trust and only secondarily on institutions such as courts of justice and police."

– Albert Einstein

OIL Turns Over a New Leaf

A Paradigm Shift

The E&P business in India has been under the state protection since independence. In order to speed up hydrocarbon exploration in all Indian blocks with state of the art technology and in the most financially attractive proposition, India during the last decade has made sweeping policy changes in the E&P sector to transform it from a state controlled one to a market driven one. Dismantling of Administered Pricing Mechanism (APM), introduction of New Exploration & Licensing Policy (NELP), opening up of E&P sector to multinationals and private players, integration of Upstream & Downstream sectors, etc. have necessitated a paradigm shift to keep pace with the changing environment and in the way E&P business will have to be carried out in India.

OIL is now aggressively pursuing acreages both in India and abroad and its initiatives have started slowly but surely bringing in results. However, success in such ventures will often require OIL partnering with other organizations to complement its strengths and to mitigate both exploration & geo-political risk. Such partnerships can only blossom on a strong foundation of trust. The global players look for attributes like transparent policy and good corporate governance in a corporation with whom they do business. It is, in this context, of paramount importance that OIL projects itself as a reliable and credible business partner with unwavering commitment towards ethical principles with the core values of honesty, integrity, transparency and mutual trust.

Co-creation of Vision

OIL, under the above scenario, felt the necessity of bringing about a transformation in the organisation to make it a vision driven one and decided to follow on the principles of a learning organisation. The corporate vision and mission drive an organisation towards its goal. OIL too has revisited its vision in the year 2003 to facilitate the change initiatives, and embarked upon a process of co-creation of its vision across the organisation at all levels. To realise an organisational vision, it is of overriding importance that each member owns the vision. It is also equally imperative that the vision be co-created by every member of the organisation for it to be fully realised. In the process of co-creation, every member of the organisation derives a common meaning and can discover values in it for him to own the vision.

Process of Co-creation of Vision

The whole transformation process started with the top management team coming together through a Visionary Leadership Program. The programme was held away from the hubbub of the workplace. A series of activities like brain storming, dialogue sessions, etc. where free flow of thought is encouraged, facilitated the co-creation of the vision and the Breakthrough Performance (BP) project for organisational transformation was launched.

The Top Team, at the corporate level, has co-created six vision components in six distinct areas as shown in Figure–1.

A Breakthrough Performance workshop was organised for the members of the Field's Top Team at Fields Head Quarters Duliajan, wherein the members also co-created their own vision. It was observed that the two sets of co-created visions agreed with each other to a great extent and thus establishing a consensus.

Most of the managers in the organisation were exposed to the concepts of Organisational Learning through a series of programs and were involved in the co-creation of the vision.

- **Business Vision**
  Oil India is the fastest growing energy company with highest profitability
- **Customer Vision**
  Oil India delights its customers with quality products and services at competitive prices
- **Knowledge Vision**
  Oil India is a learning organisation , nurturing initiatives, innovations and aspirations with best practices
- **Values Vision**
  Oil India is a team committed to honesty, integrity, transparency and mutual trust creating employee pride
- **SHE Vision**
  Oil India is fully committed to safety, health and environment
- **CSR Vision**
  Oil India is a responsible corporate citizen deeply committed to socio-economic developments in its areas of operations

Figure–1

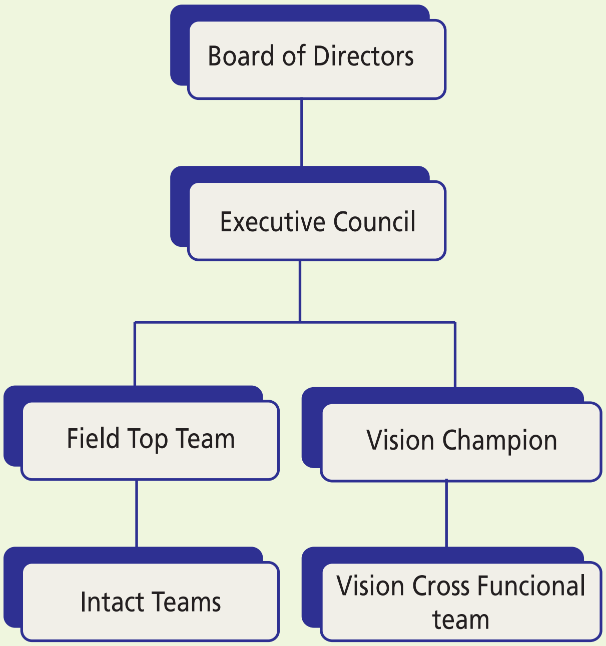
The BP Structure

The topmost body formed to oversee the realisation process is the Executive Council (EC). It had originally 18 members. This is the highest body in the hierarchy who is responsible for taking policy decisions and providing guidance in all matters concerning Breakthrough Performance (BP).

The second level in this BP Structure is a team of 6 Vision Champions (VC). The responsibility for realisation of each vision component was entrusted to one of these 6 VCs. The VCs are either Directors or the senior most General Managers of the organisation.

In turn each VC has formed his own Vision Cross Functional Team (V-CROFT) to assist him in drawing up a broad action plan for realisation of the respective vision. The BP structure is shown in Figure–2 below.

BP Structure for Vision Realization



Figure–2

BP Coaches

A team of 14 volunteers (officers having passion) were selected to act as Breakthrough Performance (BP) Coaches. The central task of the BP Coaches is to facilitate the transformation process, align people to the vision and facilitate them to think and perform in an innovative way to help them achieve breakthrough performance; and in the process realising the organisational vision. The coaches have initially undergone intensive training to equip themselves with the tools necessary for the assignment. The BP Coaches also assisted / guided the Vision CROFTs.

Intact Teams

As an outcome of the initiatives taken through the BP process, a team-based structure evolved for the entire organisation. Accordingly about 80 Intact Teams were formed for carrying out various functions and activities of the organisation. These intact teams were formed on the basis of their members' functional relationship with each other. Each team comprises of some core and full-time members and a few other shared and part-time members. A BP workshop was conducted for each intact team where the team vision was co-created and the high leverage areas (HLA) in the activities of the teams were identified. A member in each team was designated as the Conscience Keeper whose one of the responsibilities is proposed to be looking after the matters related to values in the team.

Making the Road Map

The Values Vision

The responsibility for realisation of Values vision was assigned to the then Director (Exploration & Development) who was designated as the Vision Champion for the Values vision. He has constituted a Vision#4 Cross Functional Team (V#4 CROFT) of 11 members from various functions and spheres.

The Meaning

The V#4 CROFT started work immediately after its formation. An ice-breaking detail discussion with the Vision Champion signalled the kick-off. The V#4 CROFT to begin with was introduced to the principles of the learning organisation through orientation workshops. The V#4 CROFT has consulted a number of books, journals, and publications and visited several sites on the net to

Common Meaning of the Values Vision:

Meaning by EC:

We Oil Indians intrinsically believe in practicing openness, truthfulness, meeting mutual expectations, sharing information and word-deed alignment with dedication to derive the emotional high, that governs our behaviours towards colleagues, customers, community, environment and the stakeholders.

Meaning by CROFT:

We Oil Indians endlessly strive with dedication to tell the truth without fear, appreciate and examine each other's view, meet expectations of one another, share information & rationale behind decisions, do what we say and derive pleasure & satisfaction from our jobs, which is the guiding principle of our behaviour towards colleagues, customers, community, environment and the shareholders

Keywords

Honesty: Honesty is the practice of telling the truth without fear, appreciating and examining each others views

Integrity: Integrity is doing what one says and saying what one does

Transparency: Transparency is sharing of information as well as rationale behind decisions and actions

Mutual Trust: Mutual Trust is meeting expectations of one another

Pride: Pride is the feeling of pleasure, satisfaction and accomplishment in doing a job

Figure–3

have a clear understanding of the key terms of the vision statement. The V#4 CROFT also attended a formal course on the subject, conducted by a premier institution of the country (IIM-K), to have a deeper understanding of values and ethics in the organisational context. After arriving at a consensus meaning of the key words and the meaning of the vision statement as a whole, (Figure–3) the same was presented before the highest body, the EC, who gave its nod to proceed.

Random Group Discussion

A suitable date, time and venue is fixed for a group of about 15-20 people selected at random. A typical Random Group Discussion begins with a presentation by one of the VCROFT members for about 20 minutes as follows

- Purpose of Visit and the day's Agenda
- Introduction of OIL's Vision and overall approach for realisation
- Understanding and explanation of the Vision #4 statement along with the key terms in it

A discussion is then started in dialogue mode to find out the understanding of the group on the vision statement and on the key words in the statement. On the basis of the common meaning, arrived at in the organisational context, the group then further discusses to identify relevant behavioural indicators. A BP coach generally guides these dialogue sessions.

Figure–4

Random Group Discussion

The V#4 CROFT then started to study further to enumerate the behavioural indicators for the core values. Once the common meaning and the behavioural indicators, for the core values, were identified, the V#4 CROFT decided to discuss the same across the organisation covering about 25% of the then strength. The discussion was carried out in a unique forum called the Random Group Discussion (RGD) (Figure–4). It was observed during a few initial RGDs that discussion of only the meaning and the behavioural indicators in isolation was not possible as well as meaningful unless some amount of rationales and current realities (CRs) are also discussed. The proceedings of each of the RGDs were minuted. The V#4 CROFT members, later on, met to study and analyse the proceedings of the RGDs. After discussing with about 25% of the executives' strength and based on the feedbacks received, V#4 CROFT modified the meaning of the Vision statement as well as of the key words in it.

Dialogue Session Ground Rules

- Interaction will only be in Dialogue mode/Guided Conversation
- Only one person to speak at a time with the mike in hand
- Others to give attentive listening
- Speak in the first person
- No taking down notes
- No mention of particular individual
- Speak to the group
- Focus on what is said rather than who says it
- All are equal and everything is within the four walls
- CROFT members are also participants

Figure–5

Current Reality (CR) Assessment

After conducting a few rounds of RGDs and having some initial impression about the Current Reality in the context of values in the organisation, the format of the RGDs was suitably modified to support more discussions on the current reality issues. The RGDs were first conducted for groups of junior level managers for assessing current reality. The feedbacks received from about 265 managers were then discussed and validated by 35 middle level managers. Next the current realities were further discussed with and validated by the Field Top Team and finally presented to the EC.

Discussions during RGDs, organised for the managers across the organisation, could pinpoint a few prominent CR issues so far as the organisational values were concerned.

Interactions with Organisations

The V#4 CROFT then visited a few organisations in India, known to have a culture of values and ethics, to have first hand information about the values, cultures, procedures, difficulties and ethics management in their respective organisations.

The Action Plan

Creating a culture of straight talk and integrity by defining the desired value system of the organisation, achieving results, acting with integrity and demonstrating concerns are some of the essentials for OIL to realize its vision. To prevent failure of the organisational changes, the transformations need to be anchored by building an ethical infrastructure and bringing in and managing the changes.

After all these initiatives and several rounds of discussions, the VCROFT finally came up with a unique action plan to make OIL realise its vision on values. It was felt that a three-pronged strategy of making people committed to the co-created vision, EC making the first move by exhibiting desired behaviours and bringing commitment towards these behaviours through repeated discussions would be the best approach at that stage for OIL to realize the vision on values.

Accordingly the action plan, required to be implemented by OIL, was drawn and classified into the following 5 areas

- Nomination of Values Champion and Informal Voluntary Group
- Identification & Documentation of Desired Behaviours
- Building Commitment
- Leadership Role Playing
- Conducting Ethical Leadership Program

The above action plan was progressively ratified by junior, middle and senior level executives. The plan was then presented to FTT and finally to EC which they agreed to and approved.

On The Path to Realisation

Leadership Role Playing

CMD set the ball rolling by issuing a formal letter requesting each and every EC member to exhibit role-playing behaviour as well as the identified desired behaviours.

Ethics Structure

A voluntary structure to oversee the entire vision realisation process on a continuous basis was suggested to be formed. The VC, for the values vision, was proposed to head this structure. The EC endorsed the recommendations and nominated one of its members to be the Vision Champion and head the structure. The VC initiated action by inviting volunteers having passion from among the managers to enrol themselves in a voluntary group to assist him in overseeing the process of realisation of values vision in the organisation. Once OIL stabilises in its endeavour in creating a culture of honesty and integrity, a more formal structure may gradually be introduced.

Ethical Leadership Programme

In the present day scenario it is an imperative that a manager in an organisation be an effective leader for the organisation to have a competitive advantage. Each and every manager needs to develop his leadership qualities. For realisation of the values vision in OIL, the managers need to be ethical leaders. To facilitate the managers acquire such qualities a customised programme, which is a blend of values and leadership qualities, has been designed in-house by the BP Coaches. This is in addition to another "Leadership Self Development Program" also designed by the BP Coaches to equip the managers with tools to become effective leaders. For more value addition these programmes may need to be outsourced to external faculties, expert in this domain in the future.

Building Commitment

Commitment is dedication for, responsibility to or involvement with a particular, course of action. It is intrinsic and comes out of choice. When we make a choice, an inner urge is generated. This inner urge propels us towards achieving our goal or desired action. Therefore this inner urge can be generated through repeated discussion on the positive impacts of the goals. Similarly commitment towards practicing the values can also be generated by repeated discussions on the organizational and personal benefits of practicing these values.

The plan, to carry on with the repeated discussion for building commitment towards the values, is the process of RGD. To cover about 1,000 managers across the organization, within a reasonable time of about 2 years, a number of teams need to conduct RGDs simultaneously. Accordingly a plan has been made to form several teams as a part of the ethics structure.

One of the members in each Intact Team volunteers to take the responsibilities of the Conscience Keeper. The responsibility of the Conscience Keeper is to monitor the desired behaviours for values in the functioning of the team. Matters related to OIL's values and associated desired behaviours are discussed in the regular Intact Team meetings. This is expected to help build up commitment.

OIL Behaviour

The co-created shared vision is the foundation on which the OIL's ethical infrastructure stands. Groups, from all levels, brainstorm what the ethical behaviours of the organisation should be, then discuss, refine and come to consensus. Inputs were taken from discussions of as many people as possible for incorporation and finally a document came into being. This document titled "Winning With Trust – Building Excellence through Core Values"(WWT), which contains the Desired Behaviours finalised through RGDs, has recently been published. Copies of this document are planned to be distributed to all employees of the organisation as well as made available on the Intranet. WWT is different from a Code of Ethics in the sense that all members of the organisation contributed to frame it and as such is self-imposed.

Examination and analysis of the WWT through regular and repeated RGDs will reinforce the identified behaviours and will act as the key to institutionalise them in the organisation's culture. In addition this will help keep the WWT active in the minds of the people at all time.

CROFT Reconstituted

In view of the fact that realization of the values vision will immensely help in realisation of the other aspects of organisational vision, a reconstituted V#4 CROFT is now working to accelerate the pace of realisation of the vision by implementing the five components of the approved action plan. After retirement of Vision Champion Shri S.K. Patra, D(E&D) from the services of the Company, Shri T.K. Ananth Kumar, Director (Finance) took the reins and is now guiding the V#4 CROFT in their endeavour.

Conclusion

A 2003 process reengineering report indicated that failure to manage the people side of change and the associated employee resistance was the top obstacle to project success. The top reason for resistance among employees is lack of awareness of the need for change. Another recent study showed that the 3 most important contributors to the success are the role of the sponsor, use of a structured change management process and effective communication.

V#4 CROFT

- Mrs. J.M. Chetia
- Dr. V.M. Bareja
- Shri A.P. Sharma
- Shri B. Khaund
- Shri D. Baruah
- Shri K.A. Murali
- Shri M.C. Nihalani
- Shri R. Kotoki
- Shri S. Goswami
- Shri S.K. Dutta

BP COACH

Mrs. P. Goswami

Figure–6

These issues are addressed in a unique style in the BP programme. The chief executive of the organisation, Chairman and Managing Director (CMD), is the sponsor of the BP project. CMD and EC meet at regular intervals to discuss on the status and progress of the BP project and to fine-tune wherever necessary. The unique structure consisting of the EC, VC and the Intact Teams along with the BP Coaches to oversee the change process is hoped to contribute immensely to the success of the project. The repeated RGDs will form a channel and help disseminate the much-needed communication on the values vision, its rationale and the related topics. It will also helps in managing the people side of change in the project as the people are free and can debate on all issues interrelated with the vision and come to a consensus decision on the course of action for realisation of the vision.

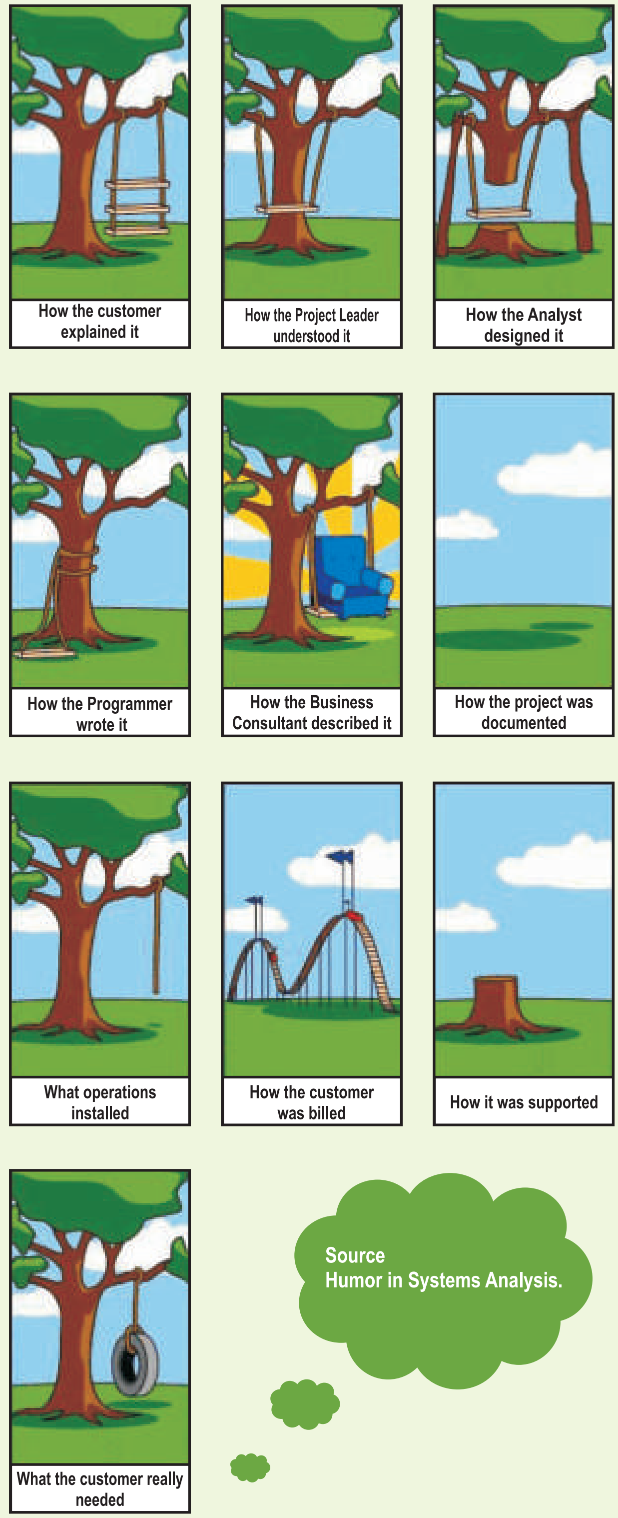
RGD is an ongoing process. To speed up the process and to cover all the managers in a reasonable time period, formation of a number of voluntary teams for conducting the RGDs are planned.

However, factors like speed of adoption of change in the organisation, ultimate utilisation of the new thinking/processes, whether the project is on course, return on investment, how employees perform in the new environment, etc. need to be monitored closely to ascertain the overall achievement of the BP project. Suitable measuring parameters and an effective instrument for close monitoring of the BP Project need to be devised.

For any corporation to grow and survive, a vision on values is a must for that sets a direction of right path. We, therefore, consider the values vision component central to and closely associated with all the other 5 vision components.

The mind of Stephen Covey aptly mirror the challenges, we require to overcome to realize our vision "… we can write and live our own scripts more than most people will acknowledge. … know the price that must be paid. It's a real struggle to do it. It requires visualization and affirmation. It involves living a life of integrity, starting with making and keeping promises, until the whole human personality the senses, the thinking, the feeling, and the intuition are ultimately integrated and harmonized."

It is the beginning of a long journey and so far only a strong ethical foundation has been laid. Lot needs to be done for a vibrant OIL to be cherished by generations to come.



Mind Benders

Questions of the QUIZ

1. The Company Universal Tube & Roll firm Equipment filed a lawsuit against this Company which was later brought by Google in 2006? Which Company was it?
2. Whose logo is this?
3. He is a fictional 19th century character. His birth date as August 7, 1852 and his full name as Dr John Hamish Watson. According to Nicholas Meyer's revisionist novel The Seven-Per-Cent Solution, he died in 1939. Whose friend and confidante was he?
4. Who was the 1st Woman leader of opposition in a Legislative Assembly in India
5. “1st Tie in an Indian election”- Name the candidates and the party they represented and how did they select the winner?
6. It a short dagger with a narrow, hollow grind blade with a triangular cross section. What type of footwear gets its name from the dagger?
7. This company, named after the founder’s daughter, began operations in 1983 with sales of a liquid fabric whitener in Malappuram and Trissur districts of Kerala. Which?
8. The less famous in this series of toys named after the founders’ grandchildren were Stacie, Todd and Cheryl. The more famous were named after their son and daughter. What were the names of the son and daughter?
9. The name of which company comes from the Danish term for “play well”?
10. Which textile brand was named after Dhirubhai Ambani’s elder brother’s son?

Names of Prize winners for Synergy Quiz

1. SK Mazumdar
2. N Ratna
3. K Radhakrishnan
4. Shakeel Intaz,
   Dy Suptd Engineer-Production
5. Rituparna Sharma,
   Administration-Kolkata Branch

Answer to Quiz Synergy 08

1. Maruti 800
2. Boneshaker (1866) manufactured by Swift cycle company at Coventry, England
3. Oriental Bank of Commerce
4. Toblerone
5. Sam Walton, founder of Wal-Mart
6. Ashok Kurien, founder of Ambience Advertising and ZEE TV.
7. Thomas Cook in 1919
8. Britannia Biscuits
9. Rooh Afza
10. The Lacoste crocodile

Production of Crude Oil and Natural Gas

Item	2005-06	2006-07	2007-08	2008-09	2009-10*
1	2	3	4	5	6
1. Crude Oil Production ++('000' Tonnes)					
(a) Onshore :					
Gujarat	6251	6212	6177	5944	5961
Assam/Nagaland	4474	4400	4357	4673.4	4740
Arunachal Pradesh	104	109	102	102.4	131
Tamil Nadu	385	353	298	265	238
Andhra Pradesh@	216	252	279	289	304
Rajasthan	-	-	-	-	447
Total (a)	**11430**	**11326**	**11213**	**11274**	**11821**
of which					
AOC	@				
OIL	3234	3107	3100	3468	3572
ONGC	8095	8058	7921	7563	7515
JVC/Private	101	161	192	243	734
(b) Offshore :					
ONGC	16309	17993	18020	17801	17341
JVC/Private	4451	4669	4885	4431	4529
Total (b)	**20760**	**22662**	**22905**	**22232**	**21870**
Grand Total (a+b)	**32190**	**33988**	**34118**	**33506**	**33691**
2 Natural Gas Production (Million cubic Metres)					
(a) Onshore :					
Gujarat	3831	3294	2931	2605	2444
Assam/Nagaland	2408	2526	2598	2573	2704
Arunachal Pradesh	48	35	30	30	40
Tripura	480	520	534	553	562
Tamil Nadu	906	1130	1169	1242	1178
Andhra Pradesh	1663	1525	1567	1524	1479
Rajasthan	242	242	255	216	239
West Bengal$ (CBM)	-	-	15	20	38
Total (a)	**9578**	**9272**	**9099**	**8763**	**8684**
of which					
AOC	@				
OIL	2270	2265	2340	2268	2416
ONGC	5751	5876	5877	5753	5633
JVC/Private	1557	1131	882	742	635
(b) Offhsore					
ONGC (Mumbai High)	16823	16567	16457	16738	17476
JVC/Private	5801	5908	6861	7348	21350
Total (b)	**22624**	**22475**	**23318**	**24086**	**38826**
Grand Total (a+b)	**32202**	**31747**	**32417**	**32849**	**47510**

Notes : **: Provisional ++ : Includes condensates @ : Includes Andhra Pradesh $Coal Bed Methane Production
Source : ONGC, OIL and DGH

ऑयल इंडिया लिमिटेड
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