

## Overview of the Oil & Gas Industry



Mark Recht – Telecommunications VP



Good afternoon ladies and gentlemen,

It is my job to try to revive everyone after a rather good lunch. My objective is to give you an overview of the oil and gas industry. I am using TOTAL as an example, because TOTAL is reasonably representative of this industry, being one of the large players in it.

I will start with an overall view of TOTAL as an organization, how it is structured, which is reasonably common with the other companies in the industry.

Then I will talk about three specific projects which have been carried out in the last few years in TOTAL. They will give you a good idea of the types of technical challenges, which face our business.

Then I will come a little bit closer to home for you and talk about a growing trend in the industry to implement optical communication links between our platforms.

I will finish with a brief conclusion.

## Total at a glance in 2003

### Worldwide locations

110,800 employees in over 130 countries worldwide



Total has nearly 111,000 employees in over 130 countries worldwide.

We began our exploration and production business (Upstream operations) in the Middle East in 1924, the year we were created. We have since developed and expanded our presence worldwide.

## Key business segment figures

Operating Income In €millions	Upstream	Downstream	Chemicals	
2003	10,476	1,970	553	
Return on Average Capital Employed	29%	15%	4%	Overall 19%
2002	9,303	969	777	
2001	9,022	3,004	1,095	
<b>Employees</b>	<b>14,017</b>	<b>34,410</b>	<b>61,212</b>	

TOTAL is structured into 3 main business units.

Firstly the Exploration & Production (or Upstream) Business Unit that searches for oil & gas, develops oil fields to recover it and operates these throughout their life.

Secondly the Refining and Marketing (or Downstream) Business Unit takes crude oil and refines it into petrol, diesel and other products. It also operates all the petrol station networks.

Thirdly the Chemical Business Unit takes the feeder products from the refineries and turns them into a huge variety of products from plastics to rubber and adhesives.

The slide shows the key business figures of each of these 3 business units.

## Key positions in 2003 Business profile - Upstream

- Oil and Gas
  - World's fourth-largest international producer, No. 1 in Africa, No. 2 in the Middle East
  - Operations in 43 countries
  - Producer in 27 countries
  - Oil and gas production: 2,539 million barrels of oil equivalent per day (2.07% of global production)
  - Reserves: 11,401 billion barrels of oil equivalent (12.3 years of production at current rate)
  - Capital expenditure: €5.3 billion
  - 2004 Exploration Budget 750k€
  - Average 4% organic growth from 2003 to 2008
- Natural gas
  - Strong position in liquefied natural gas (LNG), expansion of gas marketing and power generation operations in Europe, the Middle East and Latin America

Oil and gas exploration and production, liquefied natural gas, midstream, power, coal and other energies, in more than 40 countries: We are the world's fourth-largest international oil and gas producer, No. 1 in Africa, No. 2 in the Middle East. It is interesting to note that the 6 oil SuperMajor's only account for 13% of world oil production, the majority belonging to national oil companies.

Our oil and gas production increased 5.1% to 2.5 million barrels of oil equivalent per day in 2003, of which around 65% liquids. This was the strongest growth of all majors.

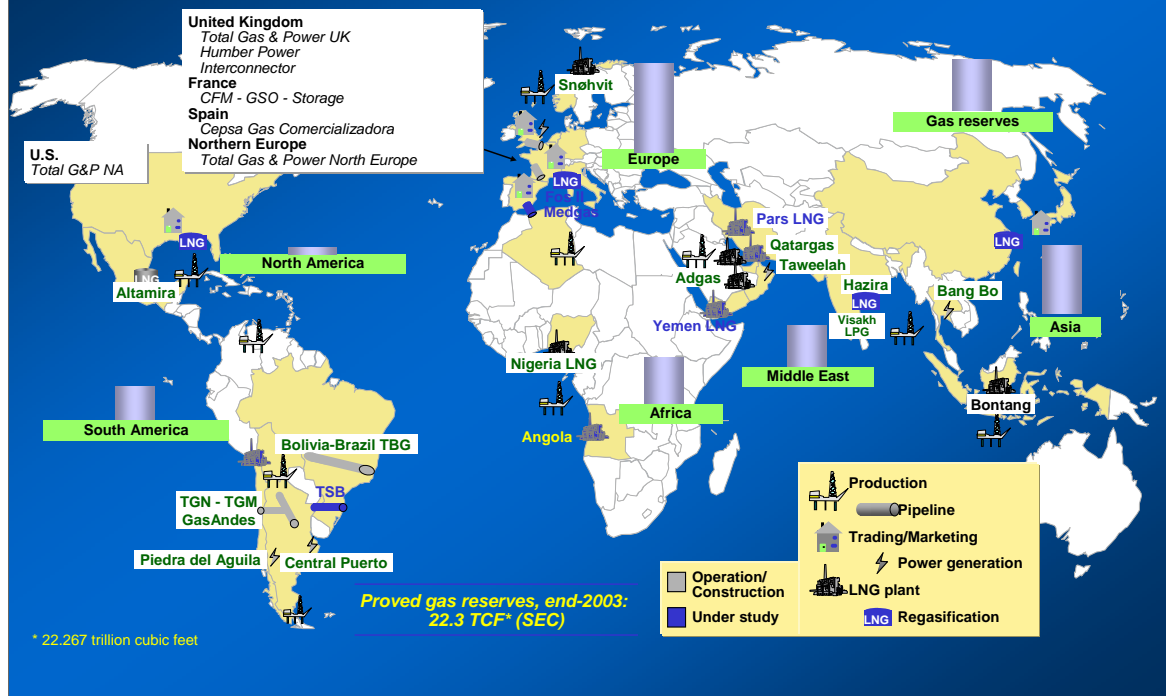
Liquids production was up 5% to 1.7 million barrels of oil equivalent, thanks to the contribution of Sincor in Venezuela, Cepsa's output in Algeria, the Balal and South Pars fields in Iran, and Amenam in Nigeria.

Gas production rose 6% to 800,000 barrels of oil equivalent per day, driven primarily by the Gulf of Mexico, Indonesia, and the North Sea. We are conducting intensive exploration programs, in which we invested €5.3 billion in 2003.

Proved reserves increased 2% to 11.4 billion barrels of oil equivalent. Liquids account for 7.3 billion boe and natural gas 4.1 billion boe.

Gas & Power experienced strong growth in its positions in 2003, particularly in liquefied natural gas. Continued production growth is outpacing our leading peers.

## Gas & Power: A global presence in synergy with our gas reserves



Our gas reserves, which account for close to 36% of our total hydrocarbon reserves, are evenly distributed worldwide in terms of risk. However, more than 60% are located in the southern hemisphere, whereas the majority of markets are in the northern hemisphere. We have to acquire interests in the infrastructure (pipelines, liquefied natural gas (LNG) chains, selected power generation projects) needed to develop local markets and global trade for existing resources and to make new potential resources commercial.

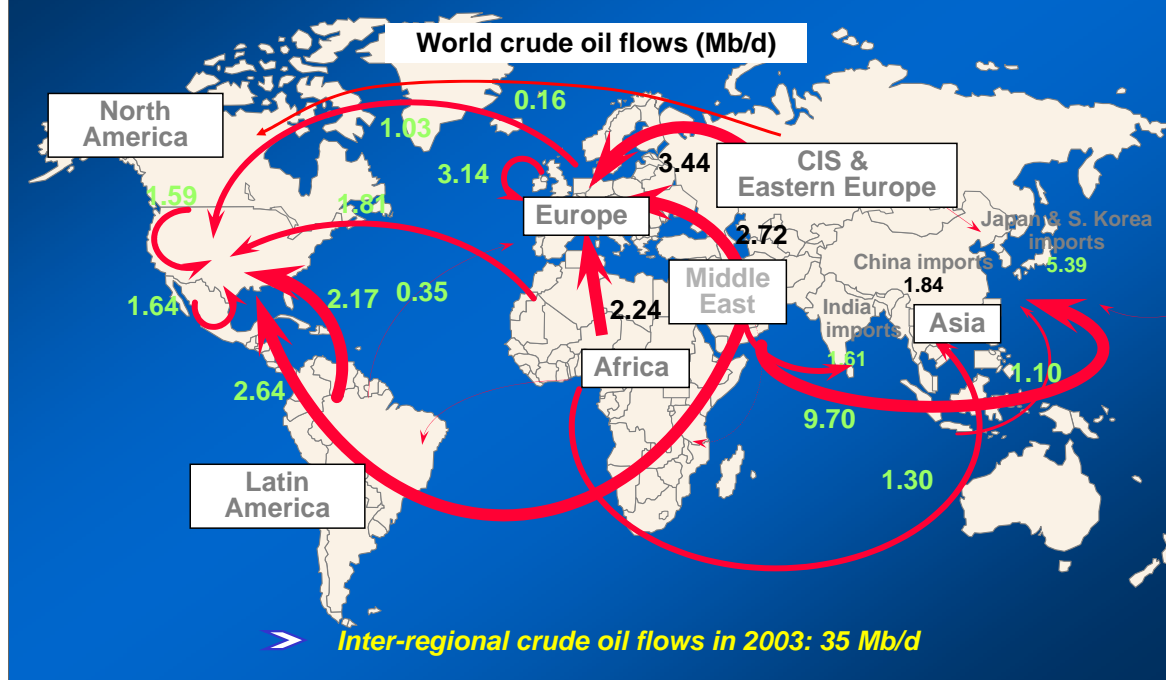
We are exploring opportunities on a case-by-case basis to increase the amounts of gas marketed, to develop reserves and production, and to encourage access to new reserves. We are strengthening our positions across the gas chain to secure or increase midstream market share.

In 2003, we produced 50 billion cubic meters of gas worldwide, slightly more than total French consumption of 45 billion cubic meters. The growing importance of the Gas & Power business is reflected in particular in our acquisition of a 25% interest in the Altamira LNG terminal in Mexico, the full commissioning of the Taweelah A1 plant in Abu Dhabi - the world's largest cogeneration facility, generating 1430 MW of electricity and producing 380,000 cubic meters of potable water per day - increased trading in Europe and the United States, and the start-up of our first wind power plant, at the Dunkirk refinery in France.

In Argentina, where a serious economic crisis is ongoing, our subsidiaries' assets were written down to preserve them. Nonetheless, our significant positions in the country make us its second largest private power generator (3565 MW installed capacity).

## The global oil market

500 Trading & Shipping employees



The crude oil market is highly fluid, global and volatile. World production was 79 million barrels per day in 2003, of which 27 million barrels per day by OPEC.

Flows between the main producing and consumer regions accounted for 35 million barrels per day, excluding flows from the North Sea to Europe, which totaled around 8 million barrels per day.

There are significant flows from the Middle East to the major consumer and refining regions of North America, Europe and the Asia-Pacific region.

Traders handle estimated physical crude movements across international borders of 55 million barrels per day.

As a result, oil trading is a major component of the oil industry. TOTAL is one of the biggest global operators, in particular in terms of amounts marketed, and we are present in all markets (crude, products and derivatives) and all regions.

## Refining & Marketing: Key positions in 2003 Business profile - Downstream

**TOTAL is Europe's No. 1 refiner-marketer and is co-leader in Africa**

- **Refineries: 28\*** (of which 13 directly operated)  
(including minority stakes, 10 wholly-owned refineries)
- **Refining capacity\*:**
  - 2.70 million barrels per day
- **Refinery runs:**
  - 2.48 million barrels per day
- **Retail network:**
  - 15,839 Total and Elf-branded service stations
- **Product sales\*:**
  - 3.65 million barrels per day
- **Capital expenditure:**
  - €1.2 billion

source: annual report.  
\* including share of Cepsa, owned 45.3% by TOTAL

TOTAL has 28 refineries (13 operated directly, interests in 15 others) in Europe (France, Belgium, United Kingdom, Netherlands, Germany, Spain, Italy), the United States, the West Indies, Africa and China.

Our total refining capacity is 2.7 million barrels per day; worldwide refined product sales averaged 3.65 million barrels per day in 2003 (including trading operations).

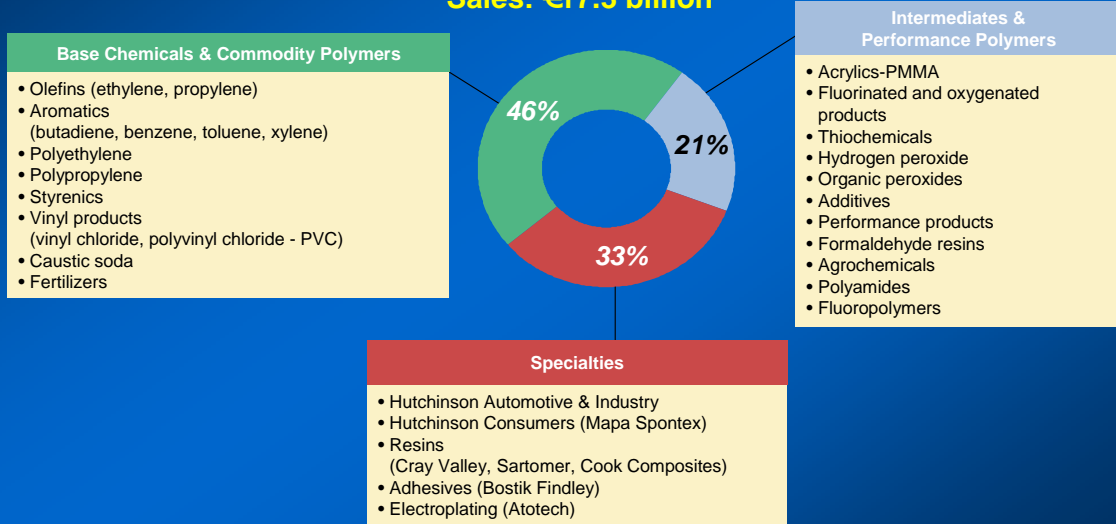
Western Europe accounts for more than 80% of our refining capacity and product sales, including our 45.3% interest in the three Cepsa refineries in Spain.

We operate a network of close to 16,000 service stations worldwide, mainly TOTAL and Elf-branded. We distribute our refined products primarily in Europe and Africa.

## Key positions in 2003 Business profile - Chemicals

A major industry player - A European or world leader in each of its businesses

Sales: €17.3 billion



The scale of its operations makes our Chemicals business one of the world's leading integrated producers.

Europe accounts for 59% of total sales and the United States 28%. The remainder is divided mainly between Asia and Latin America.

### 3 Differing Examples of Major Exploration/ Production Projects

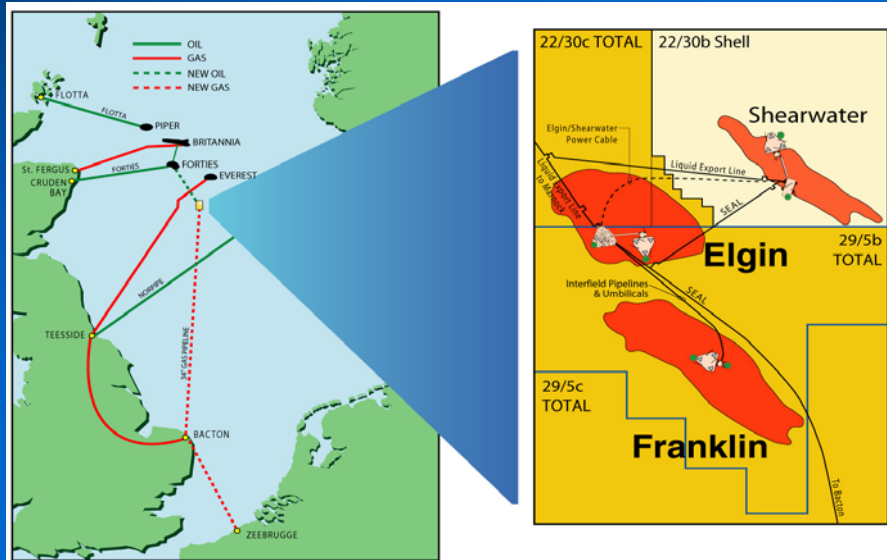


The Exploration & Production business unit contributes the most to the company results and also consumes the largest amount of capital. It operates in difficult countries, with complex commercial and technical constraints.

The three projects presented have in common a high level of technical challenge and use of leading edge technology, but are all extremely different in terms of the nature of the challenge and techniques used to overcome them.

## Elgin/Franklin Fields and Infrastructure

Largest North Sea development since 1980



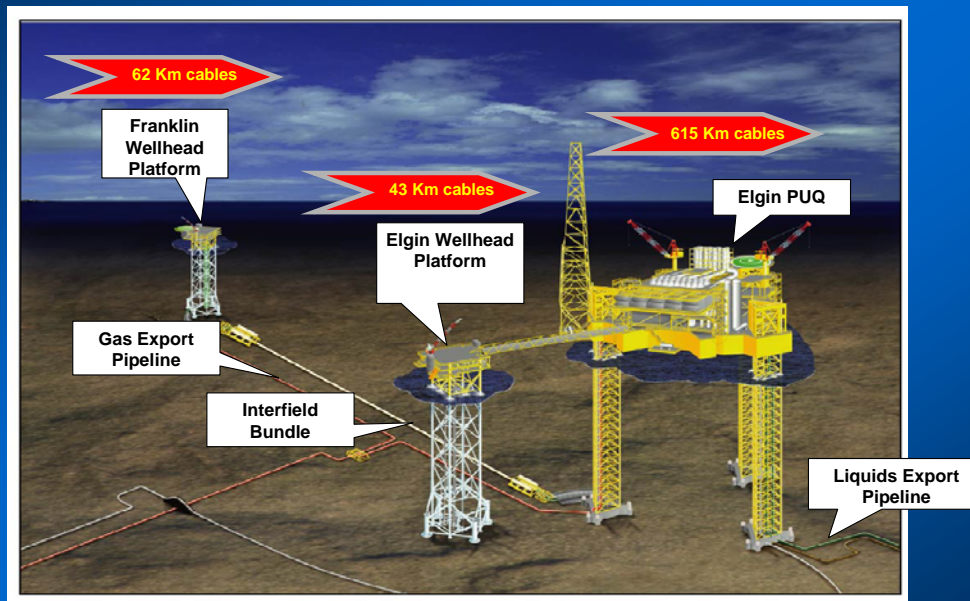
There are more than 150 oil and gas fields spread across the North Sea Continental Shelf between the Netherlands and the Shetland Islands. Production of these resources began relatively recently, with legislation governing operations in the area only being passed in 1958-1964.

Right from the start, tapping these resources was a huge industrial undertaking, from both a technical and a financial point of view, and was carried out under extreme conditions, making the North Sea a proving ground for a number of offshore technologies.

Then, starting in the mid-1980s, the North Sea threw down a new challenge, with the discovery in 1986 of a major high-pressure/high-temperature (HP/HT) condensate gas field in the Central Graben zone. Two appraisal wells drilled in 1988/89 and 1991 confirmed the huge size of the reservoir, which was named Franklin.

Then in 1991, TotalFinaElf discovered another HP/HT reservoir only six kilometres away; this was named Elgin. These two fields were exceptionally deep compared to most North Sea oil and gas fields, resulting in much higher reservoir pressures and temperatures. Elgin and Franklin are located in a structurally complex zone, with the reservoirs lying more than 5 km below the seabed, meaning that reservoir pressure rises as high as 1,100 bar (16,000 psi) while temperatures can reach 190°C. This made Elgin/Franklin project the largest joint HP/HT development ever undertaken anywhere in the world.

## Elgin/Franklin Field Facilities



In November 1995, the project partners reached agreement on the selected production plan. The Franklin field has an unmanned wellhead platform connected to the Elgin PUQ by a subsea interfield pipeline system. The two fields are served by a common central unit, a process, utilities and quarters (PUQ) platform located at Elgin and linked to the Elgin wellhead platform by a 90-metre bridge.

The 41,000-tonne PUQ, with its innovative jack-up design based on the TPG concept, is the largest structure ever built for North Sea operations. Like all the other elements of the project architecture, the PUQ complies with the stringent safety and environmental regulations applying to North Sea operations. The basic role of the PUQ is to collect, separate and treat the produced hydrocarbons.

The liquids are exported ashore via the existing Forties Pipeline System (BP) to Kinneil, near Edinburgh. The fully-treated gas is transported via the newly-built SEAL pipeline (Shearwater Elgin Area Line) shared with the neighbouring Shearwater platform to the Bacton terminal 468 km to the south, where it can either be distributed via the UK's National Transportation System (NTS) or exported to Europe via the Interconnector gas pipeline. Elgin/Franklin was brought onstream in only four years and within budget, demonstrating TotalFinaElf's ability to manage large-scale projects. The project also demonstrates technical solutions that can be used to develop other HP/HT fields in this major hydrocarbon province that accounts for a quarter of the Group's proven reserves.

## Elgin Production, Utilities and Quarters Platform & Well Head Platform



There are various different type of drilling rigs for example semi-submersible and “jack-up”, used for drilling test, exploration wells and production wells used to produce oil and gas once it is discovered.

Some platforms have their own drilling apparatus installed, and drilling continues almost permanently to reach the furthest crevices of oil and gas. Others like Elgin/Franklin have no permanent drilling capability with the necessary wells being drilled as part of the initial platform construction.

Here the Magellan jack-up rig can be seen attached to the Franklin platform. Sometimes it is necessary for rigs to return for subsequent drilling (called work-overs) to maximise collection of hydrocarbons or overcome an unexpected production problem.

Drilling took a total of 2883 days with an average of 90 days for each well at a depth of 5500 m.

Rigs cost approximately 200 k\$/day, with a typical well around 10 M\$ and only 1 in 10 chance of success !

## Elgin/Franklin Main Characteristics



Here you can see the sort of investment which is required for a oil production platform. Elgin/Franklin has enough reserves to supply all of the UK for roughly eight months and produces about 6% of its needs every day.

The reservoir pressure of 110 bar is nearly four times the north sea norm of 30 bar and the temperature of 190 °C more than double the norm of 90 °C.

The water depth is relatively shallow in comparison with the next project at 90 m.

Although the development time of 4 years after the project was sanctioned is relatively quick, Franklin was discovered in 1988 and Elgin in 1991.

## Elgin/Franklin - Development Challenges

- **Largest High Pressure/Temperature Field in the World**
  - In 1995 when the project was launched, the technology did not exist to handle the prevailing conditions
- **Difficult and costly field appraisal programme**
- **Development drilling: long, costly on technology edge**
- **Extreme reservoir conditions:**
  - Onerous mechanical, metallurgical, processing demands
  - High level of gas acidity

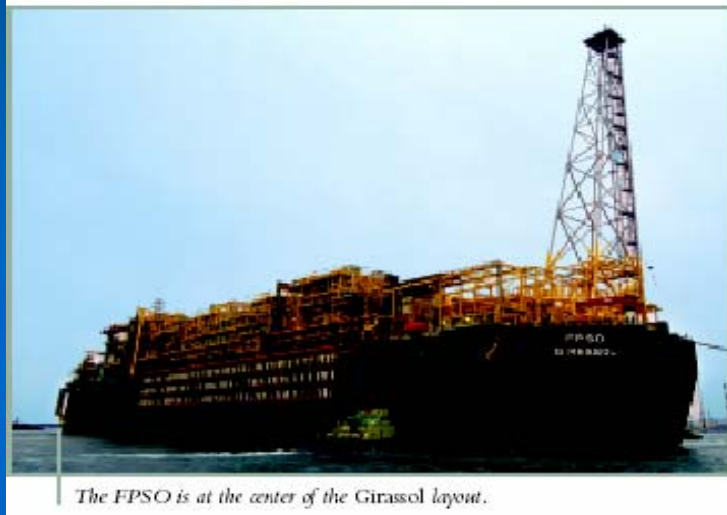
As well as the challenge of dealing with high temperature and pressure and corrosive gas, the PUQ is an innovative jack-up platform offering numerous advantages over alternative: The platform could be produced, assembled and delivered ashore, thus allowing substantial savings in terms of offshore commissioning.

The 41,000-tonne giant – the largest platform of its type in the world – was built at the Nigg yard (in northern Scotland, near Inverness), the largest facility in Europe. Construction required 11.5 million man-hours of work, with 3,600 workers involved at the peak of activity.

In July 2000, the platform was towed to the Elgin site and its three 140 m legs hoisted the structure 22 m out of the water directly over the field.

## Girrasol Project - Angola

A deepwater development in 1,400 meters of water, located 150 kilometres off the coast of Angola



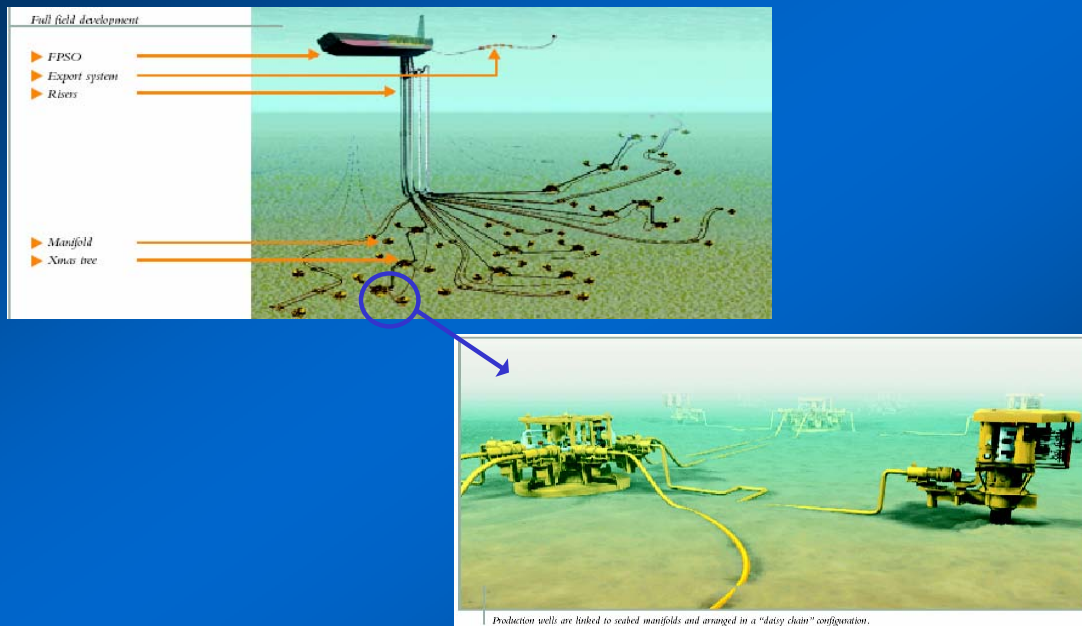
*The FPSO is at the center of the Girrasol layout.*

Girrasol contrasts with Elgin/Franklin in many ways, the most obvious being the water depth of 1400 m compared to Elgin/Franklin's 90 m. This eliminates the possibility of a platform fixed to the sea-bed, so instead a floating, ship-type unit (Floating Storage & Offloading Unit – FPSO) is used which processes the hydrocarbons and stores them before they are offloaded by tanker, as there is no suitable pipeline infrastructure or market as in the North Sea.

The FPSO was made in Korea, at the Hyundai Shipyard (now the largest in the world), taking only a record 33 months for both the hull and the topsides.

Towing to Angola then took 100 days.

## Girrasol Construction Details



This diagram shows the other distinguishing features of Girrasol – the fact that all the wells are “subsea”, connected by manifolds in a daisy chain configuration which are the deepest installed anywhere in the world today. Obviously installation & maintenance is much more complex than for Elgin/Franklins 2 fixed, surface wellhead platforms, relying heavily on sophisticated underwater vehicles.

You can also see the rigid pipelines attached to a mooring buoy, fixed to the sea-bed by 9 anchors, 1.6 km from the FPSO. Tankers then connect to these lines in order to offload crude oil.

## Girassol Main Characteristics

- Overall capital costs €2.8 billion (FPSO €20 million)
- Initial Reserves 1550 million Barrels Oil Equivalent  
(UK needs for 1.25 yrs)
- Reservoir depth 3000-4000 m
- Water depth 1400 m
- Plateau Production 200 K Barrels Oil Equivalent (6% UK needs)
- Subsea Production Wells 23 (connected by 11 manifolds)
- Water/Gas Injection Wells 14/ 2
- Core Crew 140
- FPSO Hull/Topsides Weight 42,000/ 25,000 Tonnes
- Development Time 6 years (discovery to first production)
- 54 km of seabed umbilicals. Each production umbilical has four hydraulic lines – two high pressure and two low pressure – plus six chemical injection lines to provide a scale and corrosion inhibitor to each well and four electrical cables for power and communications
- Total cable length approximately 650 km, covering instrument, electrical and telecomms

Girassol has three 26 MW turbo generators, with various secondary and backup systems for its power generation needs.

Gas compression is done by two 25 MW compressors.

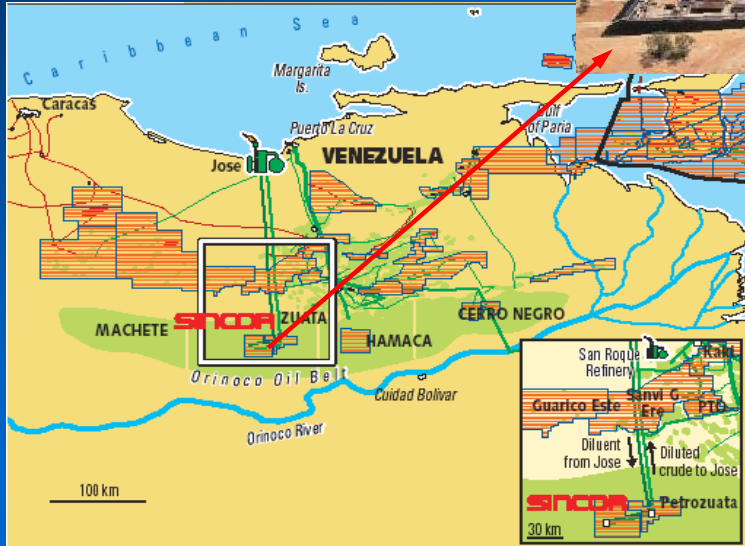
## Girassol - Development Challenges

- **Water Depth and Low Temperature (Hydrates Formation)**
- **Little Offshore Infrastructure in Place**
- **Need for Water Injection up to 390 K barrels/ day and sulphate removal facilities (largest in world)**
- **Sand control**
- **Limited number of rigs capable of working in the water depths at Girassol**
  - Custom-built, dynamically positioned, new units ordered
  - 39 wells, average 30 days each at 300,000 \$/day

Girassol in common with many platforms has insufficient natural reservoir pressure to force the oil to the surface and so water is injected under pressure to the reservoir to force it out. Almost double the quantity of water is injected than oil produced daily.

In addition, some gas is produced with the oil, but not enough to be worth exporting. In the early days of the oil industry gas was considered a nuisance and often burned off. Nowadays, this is never done and it is either piped away, or as in the case of Girassol, re-injected to increase reservoir pressure where it dissolved in the oil, enriching its hydrocarbon content.

## Sincor Location in Venezuela



Sincor is another project, totally different from Elgin/Franklin and Girassol. For a start, production is on-shore rather than off-shore as shown in the map above.

The other distinguishing factor is that the hydrocarbon reserves are very heavy, almost like tar and will not flow like normal crude. In fact the world's heavy crude resources represent ten times the volume of available conventional crude making them a very valuable future energy source which has as yet been little exploited. Unfortunately recover rates are low compared to conventional oil.

So Sincor actually consists of an upstream production facility at San Diego and a refinery at José (approximately 200 km away), which converts the tar-like hydrocarbon to synthetic crude oil.

## Sincor Upgrader Facility - Venezuela



In order to get the tar-like crude out of the ground, there were 2 main options – firstly to inject high pressure, superheated steam or to use a chemical diluter. The chemical diluter was chosen as it enables more oil to be recovered and avoids the CO<sub>2</sub> emissions that steam generation would have meant.

So chemicals are injected by the San Diego pumping station to thin the oil which is then pumped to the upgrader facility at the coast.

The upgrader facility treats the oil to turn it into synthetic crude and separates the chemical diluter which is returned to the pumping station via a second narrower pipeline.

## Sincor Main Characteristics

- Overall capital costs €4.2 billion (1/3 Upstream, 2/3 Upgrader)
- Initial Reserves 100-300 billion Barrels Oil Equivalent  
(equivalent to all the oil in Saudi Arabia, in an area the size of Switzerland)
- Reservoir depth 350-600 m
- Production/day 200 K Barrels Heavy Crude
  - Oil Equivalent 180 K Barrels Synthetic Crude (6% UK needs)
- Production Wells 1500 (over 35 year field life)
- Development Time 5 years
- Upgrader total cable length approximately 1000 km, covering instrument, electrical and telecomms
- 400 km Piping, 40 million manhours

The Sincor project was very capital intensive, as it required the upgrader facility to be built which accounts for two-thirds of the cost.

The reserves are huge, equivalent to all the oil in Saudi Arabia in an area the size of Switzerland.

Another striking feature of Sincor is the large number of wells to be drilled over its life – 1500, compared to Elgin/Franklin's 11 or Girassol's 23. So far 234 have been drilled at a total of nearly 700km.

The Sincor organisation also worthy of note, it being an independent Operating Company consisting of personnel from all shareholder companies (Total has 47% of the Sincor capital, PDVSA 38% and Statoil 15%).

Traditionally, risk is always shared by investment from several oil companies for any given venture, but one is normally chosen as operator of the field on behalf of the consortium.

## Digital Oilfield – Fiber Optic Enabling Technology

### The Prize – Bringing the Oil Platform Ashore

- **Remote Sensing**
  - Time lapse, allowing identification of bypassed oil, mapping of flow paths and barriers
- **Visualization**
  - Helps field development planning teams accelerate recovery rates and reduce costs
- **Intelligent Drilling and Completions**
  - Place the drill in the right spot and avoid problems
- **Automation**
  - Remote monitoring & control, enabling better prediction & optimisation
- **Data Integration**
  - Between different disciplines – Drilling, Reservoir, Production...

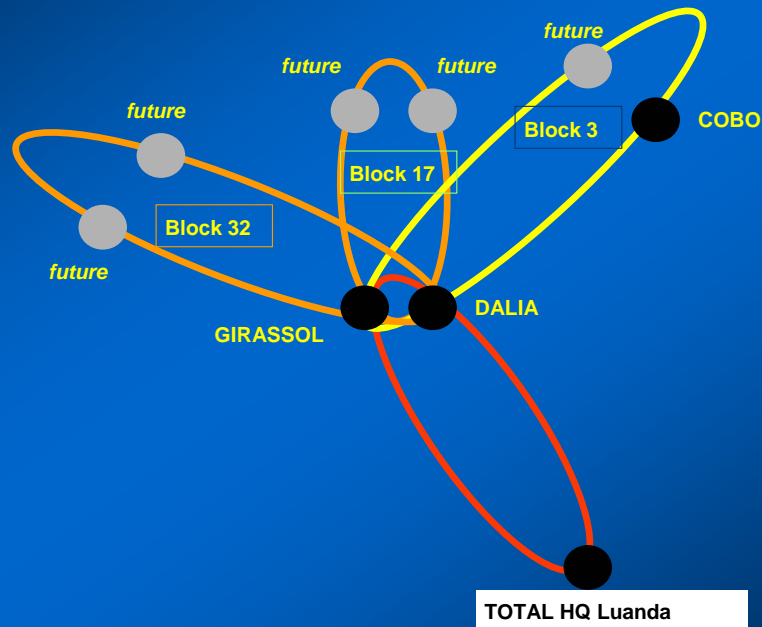
We have seen that the oil industry consumes a fair amount of cable during its various projects and this tends to be in a fairly classical way.

However, in recent years we have seen increasing interest in the possibilities afforded by the use of fiber-optic cables for communication with oil & gas production platforms.

The last section of the presentation covers some of the initiatives in this area.

Firstly, consider some of the benefits of high capacity, high quality communications that fiber cables can provide.

## OOL - Design - Architecture (ANGOLA)



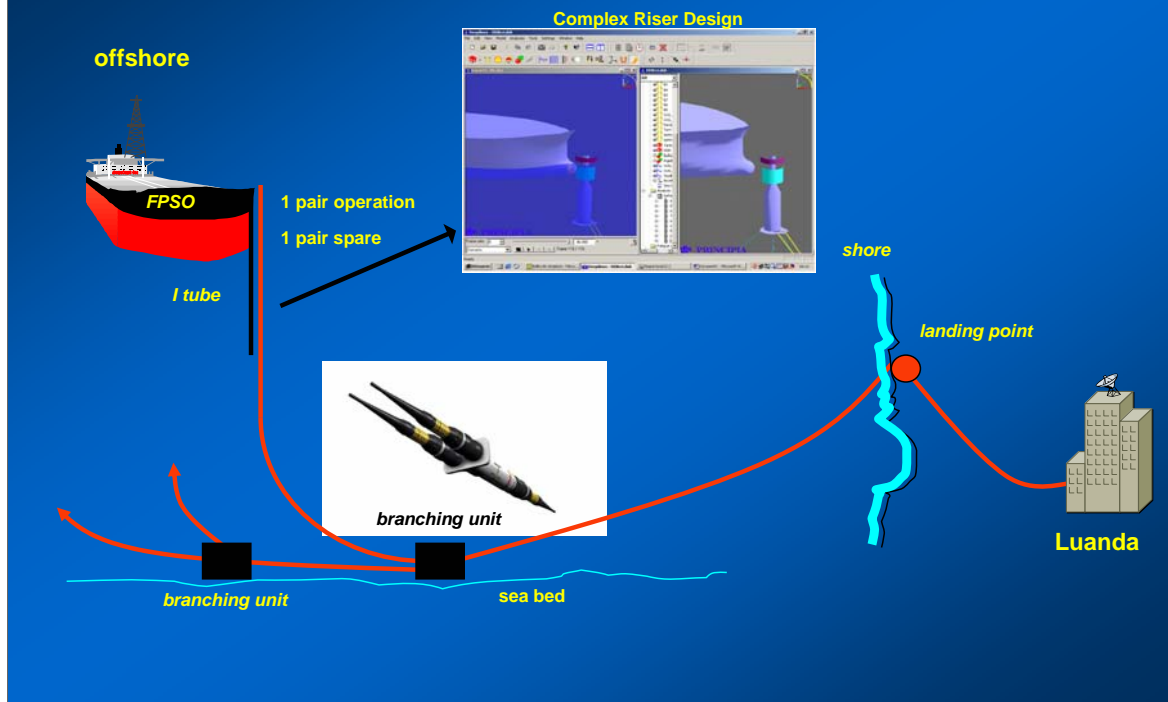
Now I like to talk about 3 current offshore optical link (OOL) projects at TOTAL in order to show you what type of cables we use and where and how they are deployed.

Dalia is a project due to come on-stream in the first half of 2006, and there is currently a project being proposed to implement 4 fiber-optic ring networks as shown above. Rings are the topology of choice from a resilience point of view – even with a cable failure, communications can be maintained through the working portion of the loop.

The first (in red) would connect Girassol and Dalia to the Company headquarters in Luanda with the second (in yellow) connecting Girassol, Dalia and Cobo.

The 2 rings in orange would be laid but left on the seabed (to reduce future mobilisation costs) for the projects currently on the slate for Block 17 and Block 32.

## OOL - Projects - ANGOLA



This diagram shows the layout schematically and also the tool used for the riser design, which is complex as the FPSO is not a stationary object, but moves with the weather!

## OOL – Cost Data - ANGOLA

3 Scenarios – Private, Shared, Third Part Service

2 Possible Topologies - STAR + RING

1 Possible Cable Routing

Budget (Ring)	K\$
Cables and joints	3,640
Marine Section	6,000
Land section	584
Terminal stations	693
Installation, tests	280
Project Mgt	690
<b>Total</b>	<b>11,887</b>

	Satellite	OOL
Rate (kbps)	720	2,500,000
Availability	99%	100%
Latency	YES	NO
Services	Standard	Enhanced
Remote Operations	NO	YES
CAPEX (k\$)	1,000	10,000
OPEX (k\$) 20 years	2,100	0
\$ / Kbps	4	0.004

STAR Configuration +26%

Shared Installation -18%

Three options are being considered for the cable – a private cable for TOTAL, a shared venture with other Operators in the area and an outsourced service.

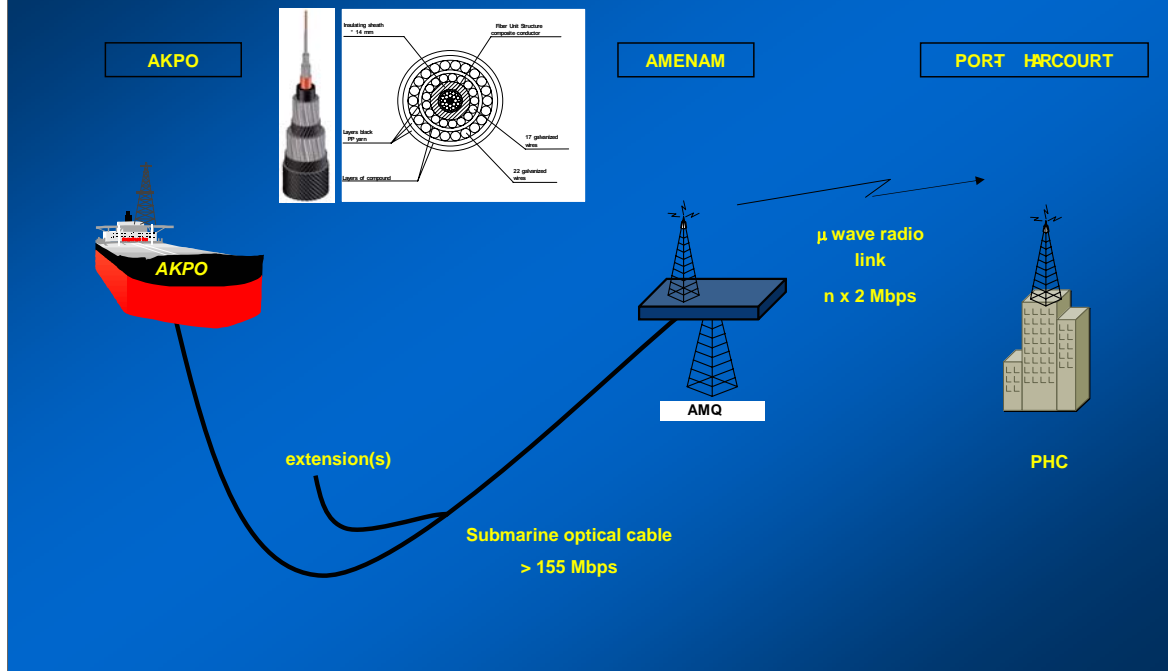
Of the 2 possible topologies, the ring as been selected and there is only 1 possible cable routing.

As can be seen from the budget, the cable itself accounts for about 1/3 of the total, the most costly element being the laying of it.

A comparison between traditional satellite and fiber-cable communication possibilities is also shown. Obviously although fiber is much more expensive initially, the operating cost is almost negligible compared to satellite.

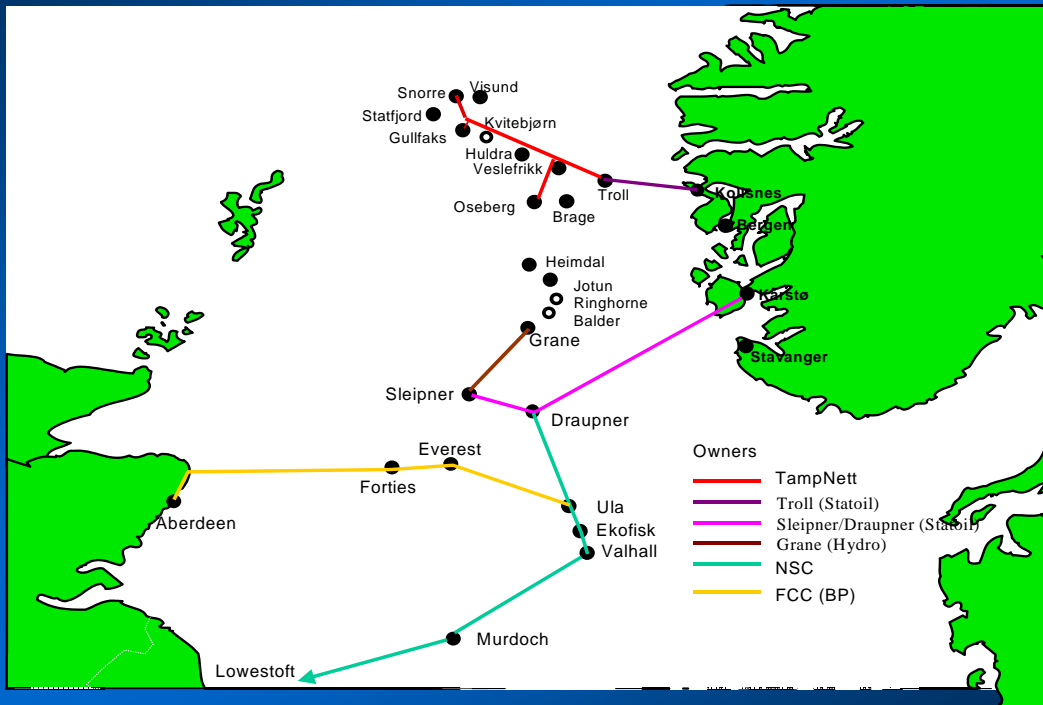
Even though the very high capacity that fiber gives is not required today, the cost per Kb/s is very low and given the long life of the platforms built today is currently felt to be good future proofing.

## OOL - Projects - NIGERIA



A quick look at a similar scheme for the Nigerian AKPO project. The recent availability of international fiber connections to Nigeria via the SAT3 cable makes this even more attractive.

## North Sea Fiber Backbone – May 2004

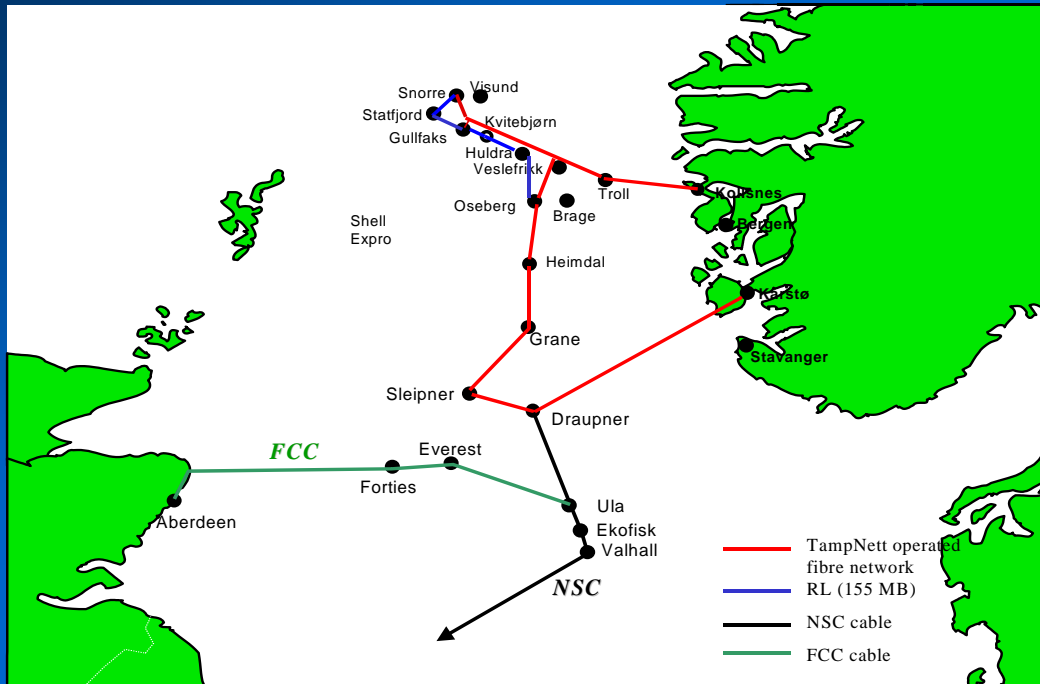


The North Sea has quite a fiber network already, being a mixture of private oil company and telecommunications operator cables.

The map shows the main cables in place today.

Only a very small number of the oil platforms in place are shown. All are interlinked by cable, radio or satellite and can potentially link to the fiber trunk links to the shore.

## North Sea Fiber Backbone – Future



This shows what is planned with the formation of two rings, one of which lands in Norway.

With the North Sea now becoming a mature environment, all Oil Companies are looking ways to optimize costs and eek out production – the use of increased information technology relying on high capacity, reliable communications is an interesting option that will serve as a test case for the rest of the world.

## OOL - CONCLUSIONS

- **Mature technology, experienced suppliers**
- **Dedicated “hardwired” link between HQ and offshore sites**
- **Architecture redundancy (ring topology) except the cable itself**
- **Much more reliable than satellite (operators durability, solar cycles, motorized antennas, maintenance, ...)**
- **No latency (satellite delay)**
- **«Unlimited» capacity (2.5 Gbps vs. 384 kbps SAT)**
  - Future proofing
- **Easy and low cost expansion**
- **Substantial CAPEX but low OPEX**

Although the systematic laying of fiber cables as part of a development project is not currently standard policy and a case by case approach is used, it is likely that this will change very shortly with the business case being accepted at a global level.

## Conclusion – The Circle of Life

The screenshot shows the Atofina website's Polyethylene Division page for Extrusion Cables. The page features a navigation menu on the left with categories like 'Our Products', 'Markets', 'Applications', 'Application', 'Market', 'Our Brands', 'Our Business', 'Our History', and 'Our Brochures'. The main content area is titled 'Extrusion Cables' and includes a circular image of a cable cross-section. The text describes the growing use of polyethylene in the cable industry and lists several advantages of polyethylene compared to alternative materials. On the right side, there are three orange call-to-action boxes: 'Safety data sheets' (with links to SDS List and SDS Search), 'Technical data sheets', and 'Extrusion Cables application is only used in Polyethylene business'. The top of the page has a blue header with the Atofina logo, 'POLYETHYLENE DIVISION', and navigation buttons for 'Contact', 'Search', and 'Print'. Language selection options for EN and FR are also visible.

**ATOFINA**

POLYETHYLENE DIVISION

POLYETHYLENE POLYPROPYLENE POLYSTYRENE ELASTOMERS

HOME

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Our Products

Markets

Applications

Application

Extrusion Cables

Market

Our Brands

Our Business

Our History

Our Brochures

LINKS

### Extrusion Cables

The usage of polyethylene in the cable industry has been rapidly growing for the last 20 years, especially for sheathing and insulation applications of power and communication cables.

**Polyethylene shows a number of decisive advantages compared to alternative materials :**

- Good mechanical (tensile, flexural, surface) properties over a wide range of temperatures
- Very low temperature of fragilization
- Excellent abrasion resistance
- High resistance to notches and cracks
- Excellent resistance to chemical agents and oils
- Low moisture vapor transmission rate
- Low dielectric constant
- High dielectric strength
- Excellent aging resistance and long-term preservation of properties.

**Safety data sheets**

SDS List

SDS Search

**Technical data sheets**

**Extrusion Cables** application is only used in **Polyethylene business**

Contact

Search

Print

CHOOSE YOUR LANGUAGE

EN FR

My conclusion is simple - that your industry and mine are part of the great circle of life and we exist symbiotically.

The Oil Industry relies on cables in order to be able to do business and at the same time we produce the raw materials that are used to make these cables.

I hope I have given you a better understanding of how these materials get to you and some of the challenges that this entails. Thank you!