



An Introduction to the Cleeton Alliance

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What Are We Doing

The Cleeton Alliance is building a new £40m Compression Platform. Its function will be to accelerate production of gas from two main existing reservoirs; Cleeton and Ravenspurn, 20 miles off the East coast of England (see Maps).

Cleeton and Ravenspurn, like all new BP developments in the area, are the names of old Yorkshire villages which have been lost to the sea through erosion.

The gas which is produced from these Villages reservoirs is mainly sold to British Gas for distribution via the national grid into our homes and factories. The Cleeton Compression (CC) platform will operate by sucking out more gas at a quicker rate, bringing in a revenue of approximately £100m.

This money will be used to pay for the platform, maintain employment, and provide investment for future new projects.

The existing Cleeton Production (CP) platform cleans both Cleeton and Ravenspurn gas and provides accommodation for approximately 30 people. The bridge connected Wellhead platform collects the gas from the local reservoir. These are shown, along with a note on where the Compression platform will be located, in the photograph opposite.

The Compression Platform will be located off the bottom left hand corner of the existing installation.



Figure 1 The United Kingdom



Figure 2 The Villages Gas Fields

Who Are We

The Cleeton Alliance is a team of companies who are totally committed to ensuring that the Cleeton Compression Project is a model for future project execution;



will be the Operator and Owner of the Cleeton Compression Platform. As a modification to the existing infrastructure there is a whole team of operations personnel whose livelihood will continue to be assured by this new addition. They are actively involved in ensuring that the platform will be safe and easily operated.

TRAFALGAR HOUSE Engineering Contractors

are responsible, via John Brown, for designing the Platform, purchasing the major equipment, instruments, piping, and electrical bulk materials. The Trafalgar House Offshore Services arm, THOS, are responsible for all offshore construction activities; modifications to the existing CP platform (tie-ins), "hooking up" the new Compression platform to these tie-in points, and commissioning (testing) the systems prior to live operation.



Brown & Root McDermott Fabricators Limited are responsible for fabricating and erecting the jacket, piles, and topsides structure (terms described later) and for "fitting out" all equipment and buying the steel.



are providing the Heavy Lift Vessel, the Stanislav Yudin for lifting and installing the jacket, piles, and topsides, and all of the marine spread for transporting the structures to the offshore location.

DRESSER-RAND TURBO PRODUCTS DIVISION

are supplying the Gas Turbine driven Compressor which provides the "suction" power.



Figure 3 Cleeton Production and Wellhead Platforms

How Are We Doing It (CC Chronicles to Date)

Reservoir Engineering

Before any investment into a new oil and gas production development can take place, people need to know if it is going to make any money. The way that this is worked out is by building a model of the reservoir (Figure 4).

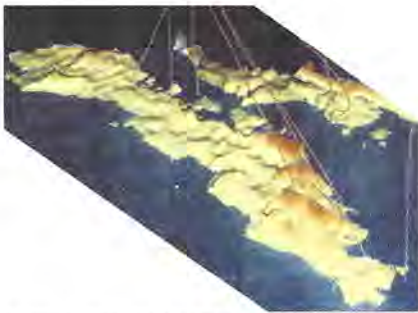


Figure 4 The 3D Cleeton Reservoir Model

The reservoir is like a sponge - only made of sandstone. Like a sponge, if you suck at it you can extract its contents more quickly and this is what adding a compressor does. The red bits

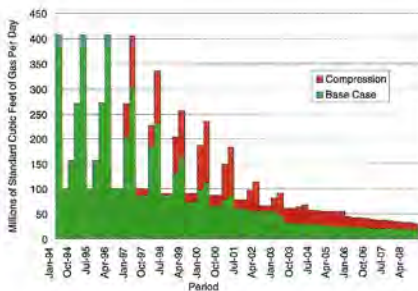


Figure 5 Effect of Compression on Production

in the graph (Figure 5) illustrate the difference that a compressor makes.

Initial Economics

The extra gas is sold and worth approximately £110m. But there are also costs - there is the cost to build the platform - Capital Expenditure, and the cost to operate it, Operational Expenditure. It is a combination of these costs which determine if the project will make sufficient profit for it to be worthwhile the investment.

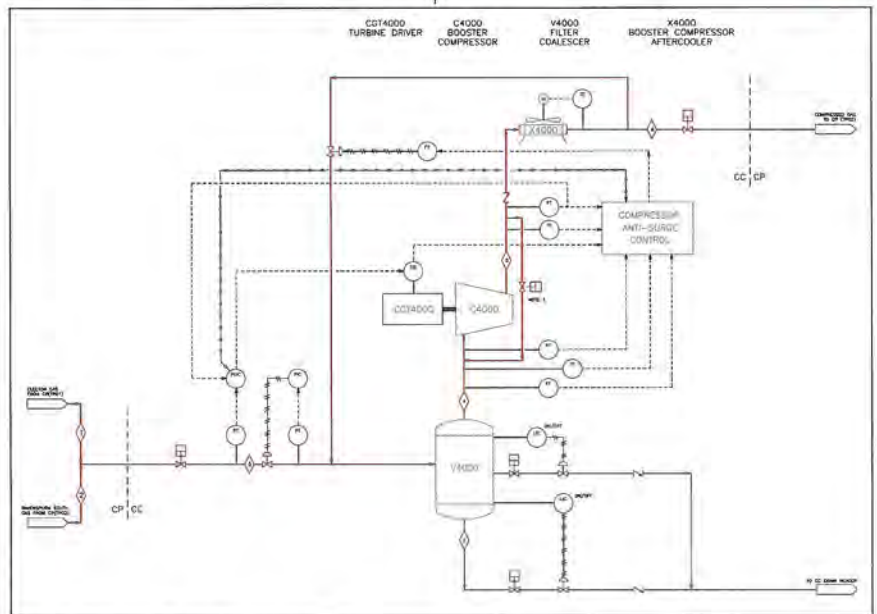


Figure 6 Process Flow Diagram (PFD)

Process Design

Once the requirement has been broadly defined, one of the first documents to be developed is a drawing referred to as a Process Flow Diagram (PFD Figure 6). Starting at the bottom left;

- Gas arrives in from the Cleeton and Ravenspurn gas reservoirs.
- It flows along a pipe, the red line in the figure, until it reaches something called a *Filter Coalescer* (the first green coloured item)
- This vessel filters out and coalesces any liquids or solids which are carried in the gas stream. These are drained off at the bottom.
- The clean gas passes out of the top of the vessel and into the *compressor*. In the process of compressing the gas, the latter sucks in a greater volume than it discharges, just like an electric fan clearing smoke in a room.
- Again like a fan, the blades of the compressor must be rotated. In this case rotation is provided by a gas turbine - an industrial version of a jet engine which burns natural gas rather than aviation fuel.
- The final step in the process is to cool the gas - some of the effort in compression gets wasted in the form of lost heat and this must be taken out.

Process Engineering

The rest of Process Engineering is about producing more detailed derivatives of the above diagram (a total of 40) and providing associated data detailing requirements for;

- the additional equipment and piping required to provide the fuel, oil, electricity, air, and water needed to operate this main equipment.
- the instrumentation and controls needed to regulate operation.
- the valves and safety devices needed to protect, maintain, and isolate the equipment in a safe manner.
- backup calculations to ensure that pipes, valves, and equipment are the correct size and made of the correct materials.

Out of this work is derived a comprehensive list of equipment to be bought and associated specifications for each.

Safety

The platform will have people working on it. High pressure gas is potentially very dangerous since a spark near a gas leak could be catastrophic. The Safety discipline ensure that everybody is focused on ensuring that a serious event will never happen to Cleeton Compression.

As part of this responsibility the group is responsible for ensuring that all Health, Safety, and Environmental legislation is complied with.

E & I

A Conversation between a Yorkshireman and a Scotsman or the second line in *Old MacDonald had a farm...?* No! Electrical and Instrumentation. The electrical engineers do the detailed work necessary to ensure that power gets to where it is needed, that the right cables and associated fittings are bought, and that there is no danger of electrical sparks causing an explosion. The instrument engineers make sure that the system logic is correct - like an automatic washing machine all of the equipment must start, stop, speed up, slow down, and open and close, in the right order. They also specify all of the gauges, indicators, control panels, and computers which make it all work.

Mechanical

Mechanical specify the detailed requirements for the equipment and ensure that they interface with the rest of the design cleanly. The main items of equipment are included in the Gas

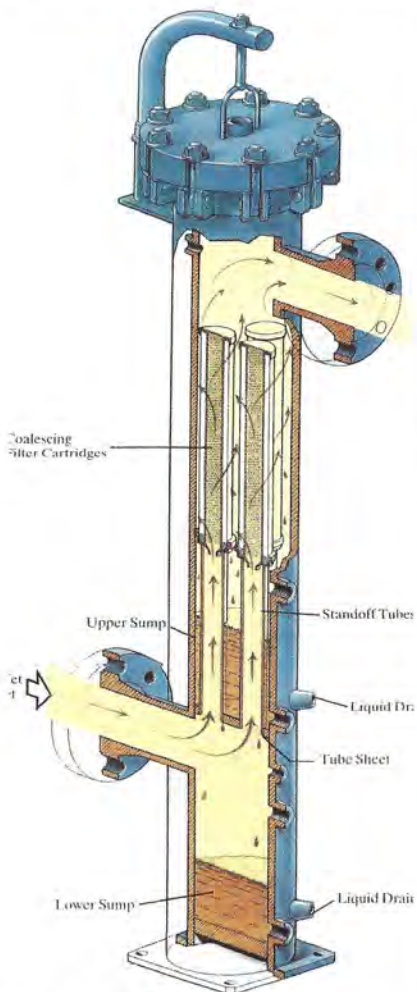


Figure 7 Filter Coalescer Operation



Figure 8 3D Model of Compression Platform

Turbine Driven Compressor Package. Since this deserves a detailed description in its own right all that will be included here is a picture of one of the more unusual items, a small version of a Filter Coalescer (Figure 7).

(Reproduced with permission from Pall Process Filtration, a Division of Pall Europe Ltd).

Piping and Layout

Piping and Layout organise where the equipment will be located on the platform and how the pipes which connect them together are organised. They also define all of the piping and valves which require to be purchased.

From the 3D model (Figure 8) and the weights and sizes of all of the items on the Platform, the structural design can be developed.

Structural (& Architectural)

The Structural engineers are responsible for making sure that the steelwork is strong enough to support the equipment. Also that the jacket (supporting structure - Figure 10) and piles (massive pins which are hammered into the seabed to hold the jacket in place) can withstand the

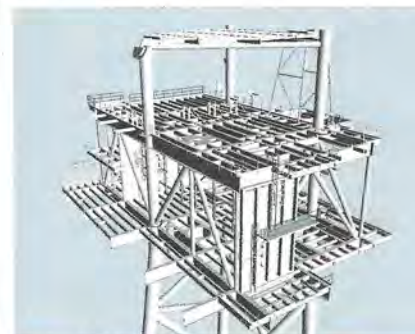


Figure 10 3D Model of Topsides Structure

battering of the North Sea environment. A considerable amount of complex analysis is undertaken to ensure that the structure meets all of the criteria.

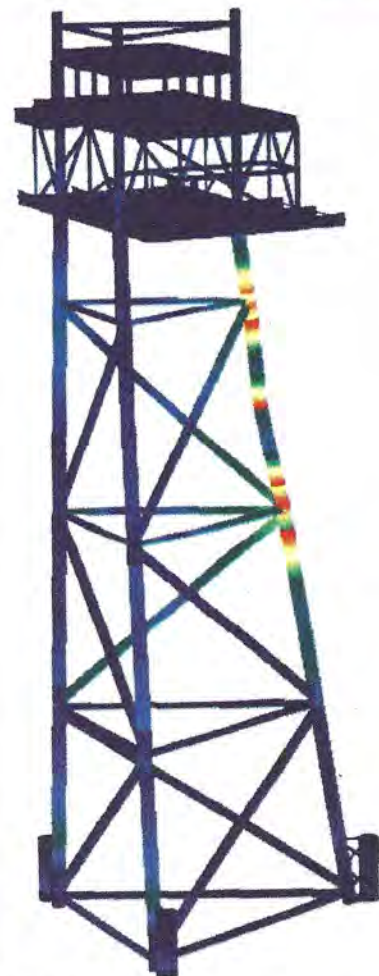


Figure 9 3D Model of Topsides Structure

The structure is also built into the 3D model (Figure 9) which, as for piping, is also used to generate many of the drawings necessary to build the platform.

Fabrication

At the end of the day all of this design has to be built (Figure 11). The details of the build process and how the platform will be installed and tested are for another day.



Figure 11 Topsides Steelwork As Built (15.6.95)



Issue 1: June 1995



Keith Gordon (BPX Aberdeen)

Asset Manager SNH

Married to : Debbie, Children : Kimberly (8), Struan (7), Erin (5), Christina (27 Dec '94, 7.25 lbs)

Manage all the Gas fields and production which we look after in the SNH sector including exploration, development, operations, and commercial aspects

"Isn't it amazing what can be achieved when you get people in a team aligned with a common purpose?"



Alan Moul (BPX Aberdeen)

Villages Business Manager

Married to : Susan, Children : Katie (9), Christopher (6), Robert (2)

Responsible for the financial performance of the Villages area - leading activities across different disciplines

"Vital for the future of the Asset. A step forward for BP in Alliancing"



Russell Streether (BPX Aberdeen)

Business Adviser - Villages Area

Married to : Lesley, Children : None - Yet?

Overall responsibility for the economic modelling of the Villages complex and associated cost accounting. Gratitude from the Editor for support on Risk and Reward and patience on economics

"The cost efficiencies likely to be achieved through formation of the Alliance have made this project worthy of close attention"



Marcus Marsh (BPX Aberdeen)

Senior Reservoir Engineer

Married to : Sheila (also a Reservoir Engineer), Children : None

Defined the required Compressor specification to maximise recovery from the Cleeton reservoirs.

"An excellent example of close cooperation between Client and Contractor organisations"



Peter Robinson (BPX Dimlington)

Operations Manager

Married to : Meg, Children : Nik (24), Tim (22)

Trying to create enthusiasm and excitement out of the onshore and offshore operations based out of Dimlington

"A new and novel approach which has been a major success with respect to relationships between people"



Peter Reynolds (DRESSER-R)

Project Manager (Gas Turbine Compressor)
Married to : Sabin, Children : Elsie (16), Ann (6)

Job Marketing and Project Management of P

"A new way of working which stimulates initiative and relationships in a friendly atmosphere de"



Chris Harrison (BP Paddington)

Project Manager - Cleeton Alliance

Married to : Sylvia, Children : Amanda (22), Sophie (21), Mark (15)

Responsible for ensuring that the Cleeton Compression Platform is designed, built, and installed and that it works in time to meet the 1st October 1996 completion date

"A unique opportunity to achieve outstanding success"



Jan Voeten (SHLE, Zoetermeer)

Installation Project Manager
Married to : Hanneke, Children : Annemarie (7)

Manage offshore transportation and installati

"Cooperation and openness provide opportunities that existed before"



Philip Jellard (BP Paddington)

Operations Interface Manager

Married to : Pippa, Children : Edward (11), Sarah (8)

Responsible for ensuring that Operations buy into all aspects of the project in the correct timescale. Act as "challenger" of past norms in order to reduce Capital and Operational Expenditures

"Extremely happy, efficient project. The best project I have worked on since I was in Holland ten years ago - and it's on a par"



Paul Capell (THEC/JBEC Pacific)

Sponsoring Director on behalf of THEC
Married to : Jane, Children : Laura (11), Hanna

To provide the Engineering Team with counsel and encouragement to achieve the Project goals

"A taste of the way that projects should be done"



Mike Cubitt (BARMAC Nigg)

Fabrication Project Manager

Married to : Rosemary, Children : Alasdair (24), Malcolm (22)

Will ensure that the Cleeton Compression Fabrication is performed to cost and on schedule by BARMAC

"Excellent working relationships. Personally find it very interesting as a job - particularly the insight into what drives Operations"



Martin Daniels (THEC/JBEC Pacific)

Deputy Project Manager
Married to : Anne, Children : Nicholas (7), Tim

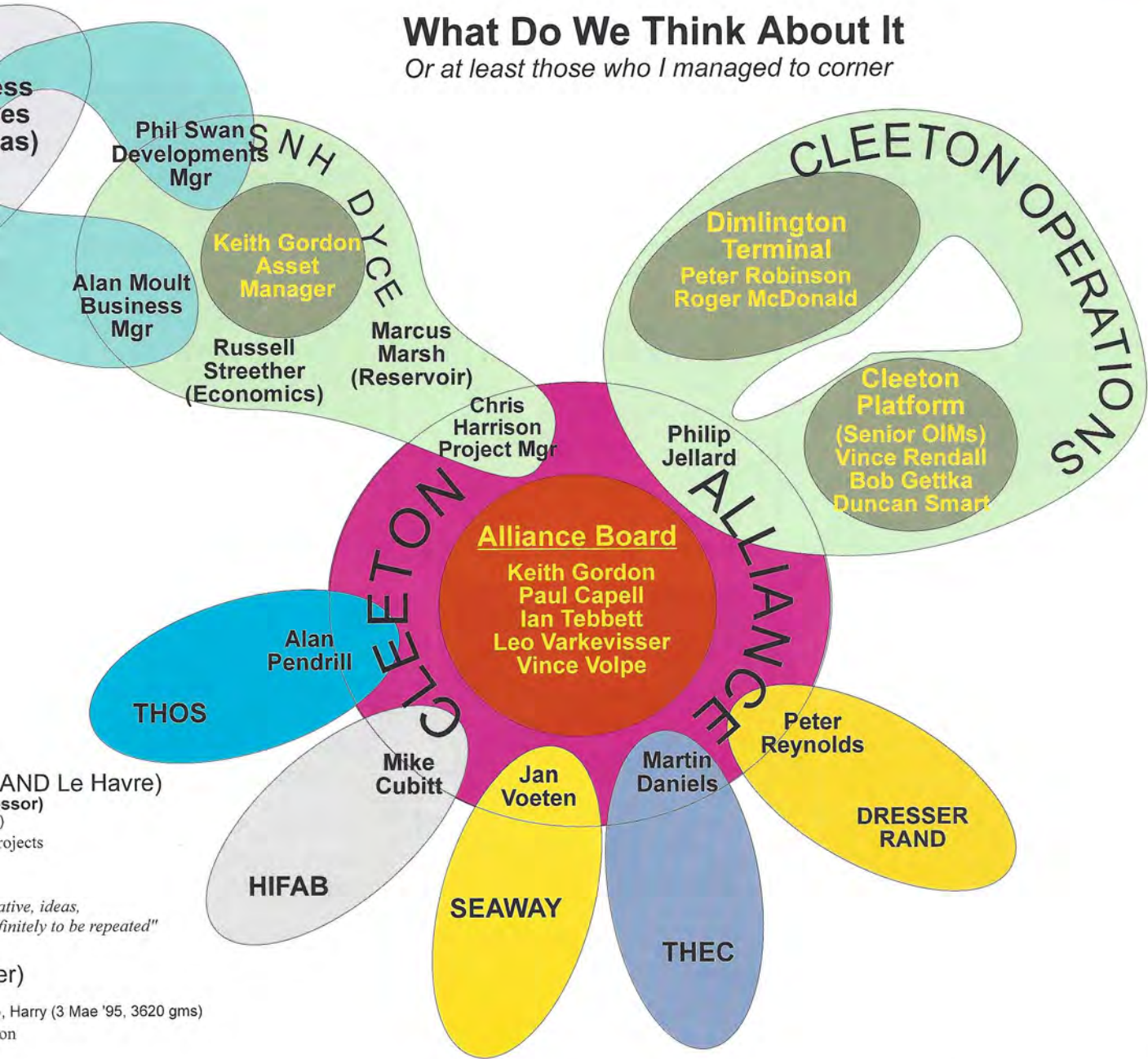
Manage the Design, Planning, Cost Control, and Materials

"The most cooperative project ever"



What Do We Think About It

Or at least those who I managed to corner



The Cleeton Alliance "Amoebaegram"

An explanation to a question no one has been able to define



Alan Pendrill (THEC/THOS Paddington)
Hook-Up and Commissioning Manager

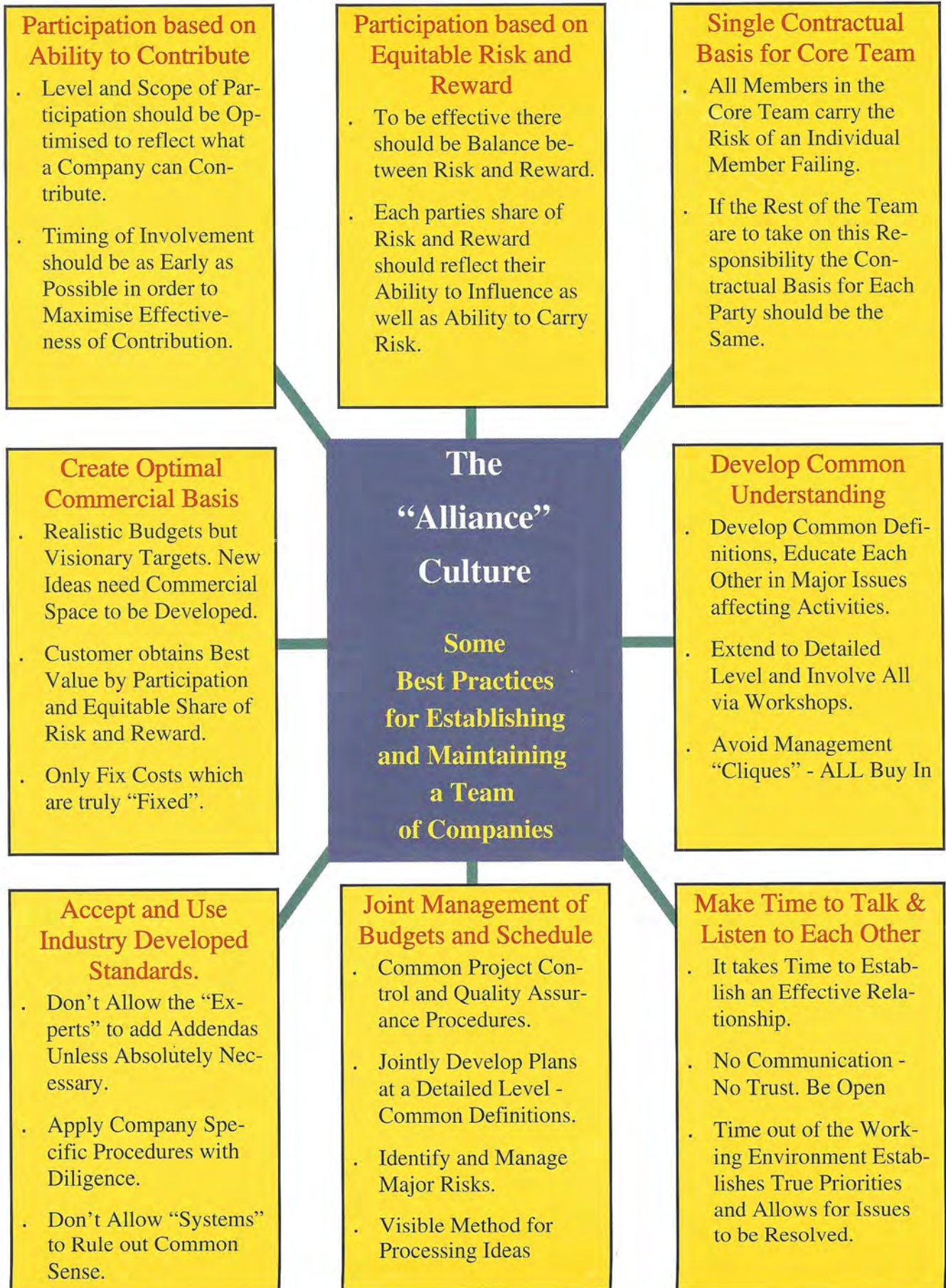
Married to : Elaine, Children : Helen (25), Benjamin (23)

All management and coordination of commissioning activities and all works to be undertaken offshore

"I find it a very comfortable environment working with the other Alliance managers. I do not feel threatened and do not feel I have to be defensive"

What Have We Learnt

(The editors opinion of good practices learnt from the Alliance.)





BARMAC



Brown & Root

Where Is It Happening

Location of the Quarter

What is BARMAC

BARMAC is a very recently formed consolidation of what was previously Highland Fabricators, a Brown & Root fabrication site based at Nigg on the Cromarty Firth, and McDermott's Ardersier yard on the Moray Firth (see Maps - Figures 12 and 13)



Figure 12 Area of Detail in Scotland

Some Local Information

Located in the north of Scotland these two construction sites are almost due west of Oslo in Norway so they are quite far north.

The nearest airport to both locations is at Inverness, five minutes from Ardersier, and 50 minutes from Nigg. Inverness itself is nestled between Loch Ness, home of the supposed Loch Ness monster and the Moray Firth.

A combination of factors has led to the placement of both of these facilities at this location.

Historically, the depth and shape of the Cromarty Firth made it a natural anchorage for naval vessels. This usage started in earnest during the Napoleonic wars and stayed that way right through the First World War. During the latter mines were placed at the entrance to block off access. Unfortunately for the Germans, the British simply cleared access channels and used the mines to further protect the Firth. Thus the whole area has a Naval tradition.



Figure 13 Moray and Cromarty Firth

However, it is the more recent development of the North Sea oil fields which has made these locations very convenient, coupled with deep water access which made these locations ideal for development in the early 1970's.

This is illustrated by the photograph below in which drilling rigs occupy the Firth - when the weather is good the surrounding countryside is beautifully remote and unspoilt.



Figure 14 Area of Detail in Scotland

What Does BARMAC Do

BARMAC's principle business is the fabrication and erection of jackets, piles, topsides, and subsea facilities. In order to do this both sites have massive sheds, protected from the weather, which allow for all the bending, welding, erection, and coating operations necessary to build the structures to be carried out. These shops have all of the cranes and facilities necessary to handle these structures.

In support there are piping, warehousing, and rolling shops for carrying out specific fabrication tasks.



Figure 15 The "HIFAB" Yard at Nigg

What's Happening Where

Pile Rolling and Piping Fabrication at Ardersier, Jacket, Topsides steelwork, and erection and fit-out at Nigg.



Figure 16 The "McDermott" Yard at Ardersier

How Are We Incentivised

The environment which pervaded the industry until very recent times was one of adversity, claims, and blame passing.

The Cleeton Compression Project has been at the front of establishing a Contractual and financial basis where;

- If any one member of the Alliance starts to have difficulties, then all other members are incentivised to provide assistance.
- If the project as a whole does well, all members of the Alliance do well - conversely if the project performs badly we all suffer.
- a tremendous team spirit, evidenced by the comments in the centre spread, has been achieved.
- For the first time this basis has been extended to cover equipment suppliers and Operating Expenditure and Availability.

How Are We Performing

Key Success Factors

The projects success is measured against the following Key Success Factors;

- Safety
- Capital Expenditure (CAPEX)
- Operational Expenditure (OPEX)
- Contract Gas Date
- Availability
- Operations Interface
- Flexibility

Achievements

In each of the above areas the project has achieved measurable success. In terms of CAPEX, the most obvious of measures, the project is predicting a significant saving over what was originally predicted for the job;

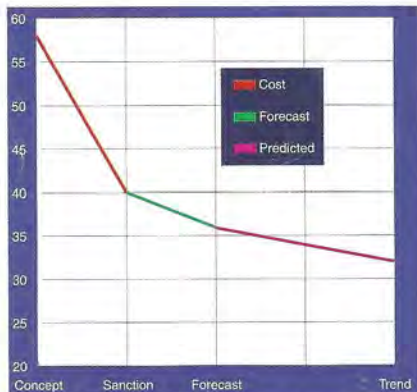


Figure 17 Performance against Capital Expenditure

- We are still on target to achieve the 1st October, 1996 start date
- It looks like the CC platform will have minimal impact on the overall Safety case - indeed the project is being proactive in addressing the wider Safety needs of the Asset.
- The Operations Interface has been stated as excellent by Operations.
- During the course of the project we have conducted studies for approaching 50 different options, we responded well to the late change to the coalescer, and are now incorporating a riser for new gas.
- We are pro-actively attacking reliability to address Availability and OPEX costs.



Figure 18 Patsy Berthier and Suki Bryant with Tee Shirts

What Comes Next

Over the next few months the project will increasingly migrate to the fabrication yards at Nigg and Ardersier.

In order to increase the visibility of the project a number of tee shirts have been ordered - these are shown above.

Future Issues

If well received, and project budget allowing, it is intended to produce a new issue of the magazine every three or so months.

It is intended that the current focus on Engineering in this issue will move toward fabrication - perhaps with something on the main piece of equipment, the Compressor Package. Contributions, on any subject, from anyone, would be very much appreciated.

Future Competitions

It was intended to have a guess the right father competition this issue - unfortunately only one baby photograph arrived in time.

If anyone has any ideas on what competitions could be worth at least a bottle of champagne please let the editor know;

All contributions to;

The Cleeton Compression Quarterly,
20 Eastbourne Terrace,
Paddington
LONDON W2 6LE (+0171 957 3647)

Competitions

The prize for best entry into the magazine has to go to Ian Cameron - he has contributed most of the humour to this issue.

Unfortunately the original photograph (the left of the two, Figure 19) did not seem appropriate. As editor I have taken the liberty of minor image surgery to better fit his contribution!



Figure 19 Ian, Before and After Image Surgery

Some more of Ian's Cleetonspeak ...

CAPEX	What you hold in your hand when talking to Projex.
Gainshare	Japanese night club hostess
Dimlington	an unmanned space station, probably
Fax It!	a euphemism
Fast track	a battle of engineering Will versus procurement Won't
SCADA	Confidence trick by Instruments to stay employed on the project longer than anyone else.
S-Curve	Sort of corporate driving test for Project Managers
HAZOP	A scrabble challenge