

R&D Topics Stimulated from Upstream Gas Processing Challenges

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Genesis Historical Overview



Front End Process

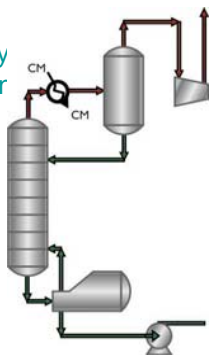


2003
Subsea Operations Group formed; Shell UMP Project Awarded

2008
Branch Offices Added

2011
Globalisation Strategy commenced

1988
Company Formator



1997
Facilities Disciplines Added

1999
Sold to Aker

2001
Part of Technip Group



Abu Dhabi Tunisia

2010
Over 700 Personnel; Turnover in excess of £90M

Rio de Janeiro Paris Stavanger

2012
Merger with DWE

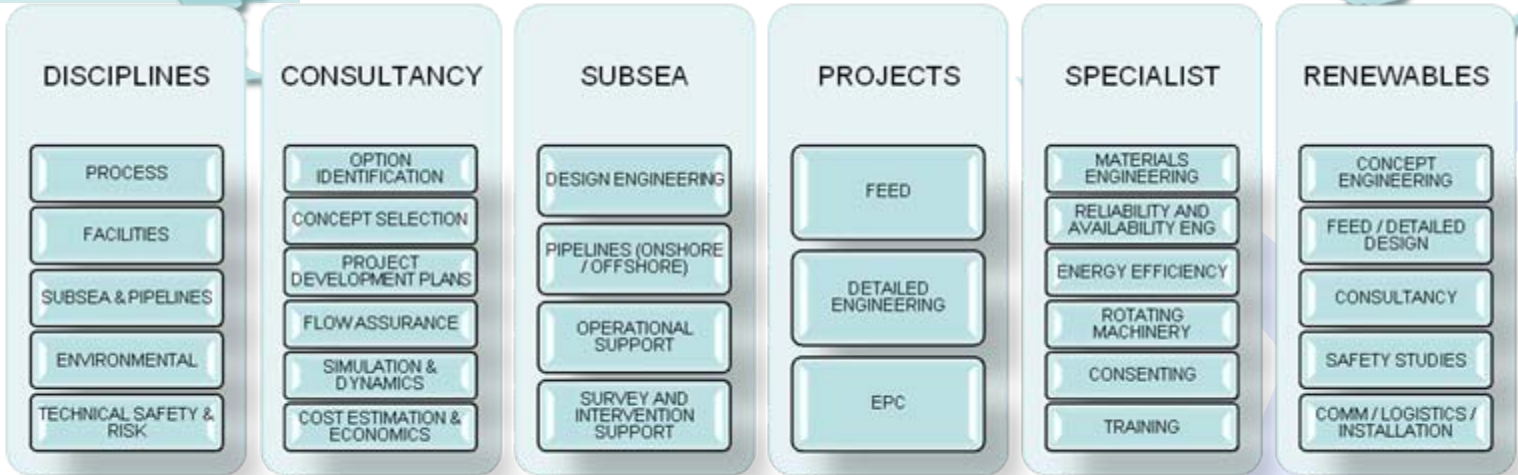




Genesis Today – ‘A Global Presence’



- 1,100 People
- Large Client Base
- Worldwide Outlook
- Geographical Expansion
- Future plans:
 - Canada
 - Far East

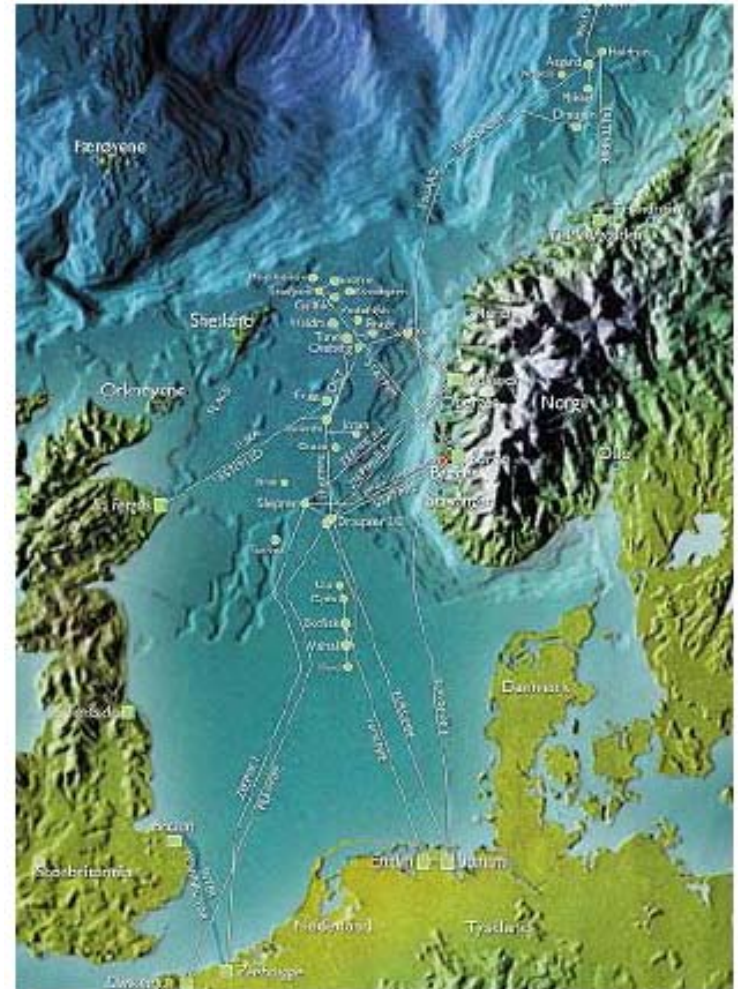


- In 1970 the Norwegian trench was considered impossible to cross
- It was "said" that Norway will become rich but there will not be many jobs onshore
- A 2 year Statoil study in late 70's concluded feasible to cross the Norwegian trench
- In 1981 Norwegian Parliament decided crossing
- Kårstø opened in 1985, with slug catcher outlet rich gas pipeline
- Today the Norwegian gas transportation and processing network comprises about 8000 km pipelines, processing plants and platforms

Did R&D pay off?

Arve Johnsen, first Statoil CEO, key person wrt crossing the Norwegian trench

"3 elements may stop us in obtaining the impossible; Human creativity – Time - Capital"



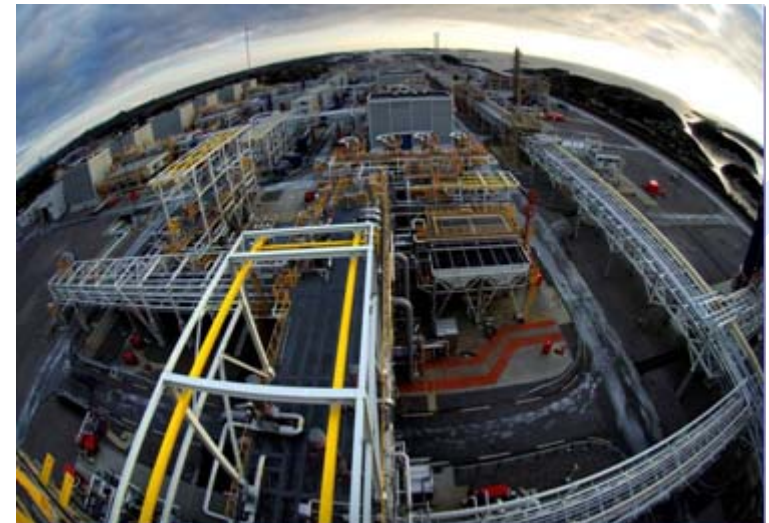
- Need for new volumes
- Aging –Life extension
- Improve safety – models related to safety
- Increase Capacity – debottlenecking
- Reduce cost brownfield project
- Improved energy efficiency
- Improve or maintain reliability
- Reduce emissions
- Changed operating conditions
- Gas quality and contamination issues
- Removal of systems and abandon area
- Holistic recovery optimisation
- Update software
- Improve metering trace elements
- Tools for inspection or intervention
- Improved prediction and monitoring
- Improved methodologies and work processes
- Simultaneous operation and project
- Improved equipment



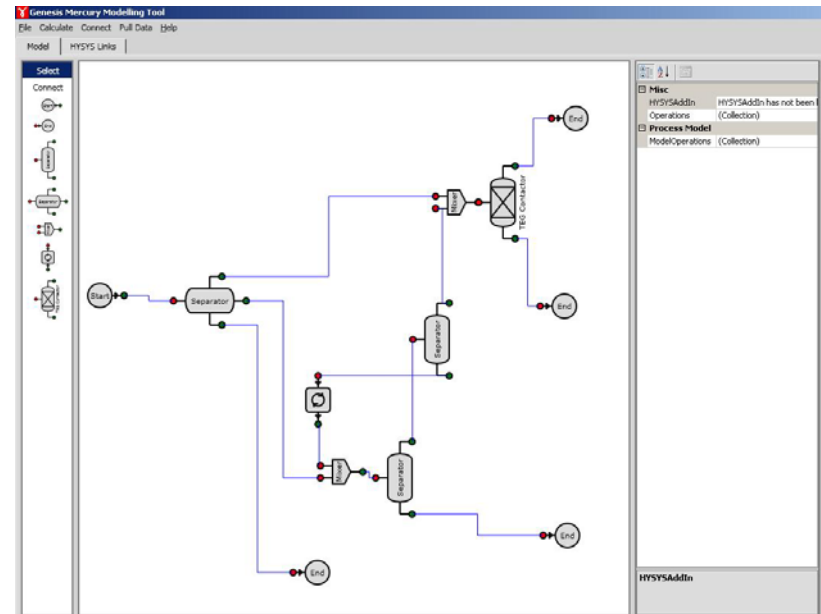
- Harsh environment
- Longer distances
- Deep
- Environment
- Offshore - ice areas – icebergs
- Subsea pre-processing
- Emergency and evacuation
- Cost reduction
- Competitive gas conversion
- Top quality/safety – models related to safety
- Maximise energy efficiency
- Maximise reliability
- Minimise emission or remove emissions
- Improved precision in models & methodologies
- Improved prediction and monitoring
- Improve metering trace elements
- Market assumptions



- Mercury modelling tool
- Operator Training System
- Optimisation tool – genetic algorithm
- Pig for unpiggable pipelines
- New depressurisation and blow-down tools
- Cost estimation tool



- Genesis Mercury Modelling Software (GMMS)
- Model mercury partitioning - topsides process
- Vapour, organic liquid and aqueous phases
- GUI
- Main molar flows, temperatures and pressures imported (Tables or HYSYS)
- Mercury partitioning factors are imported
- Mercury inputs

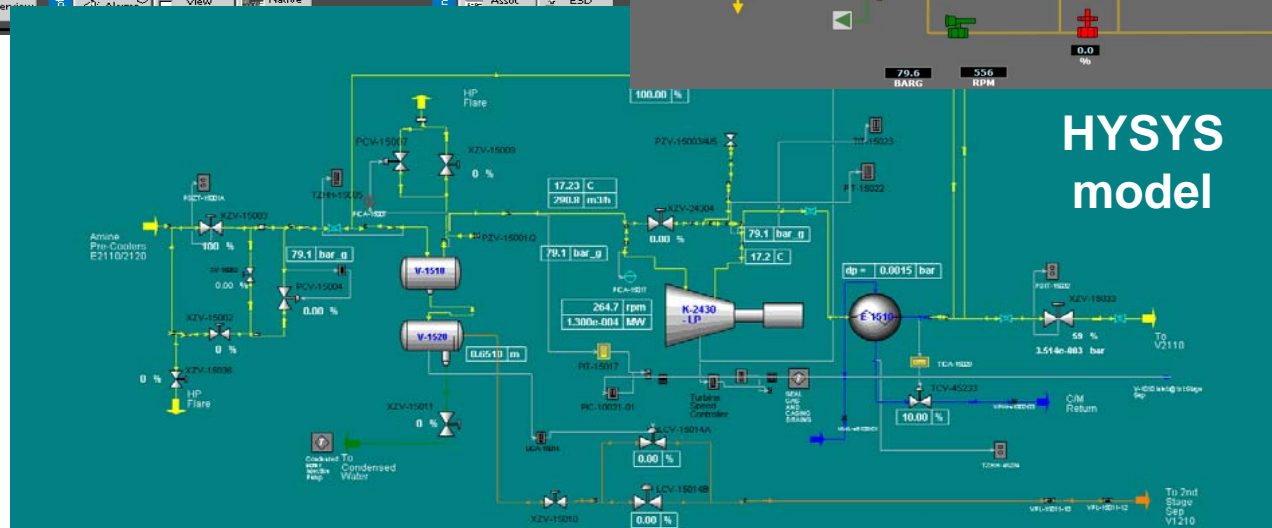
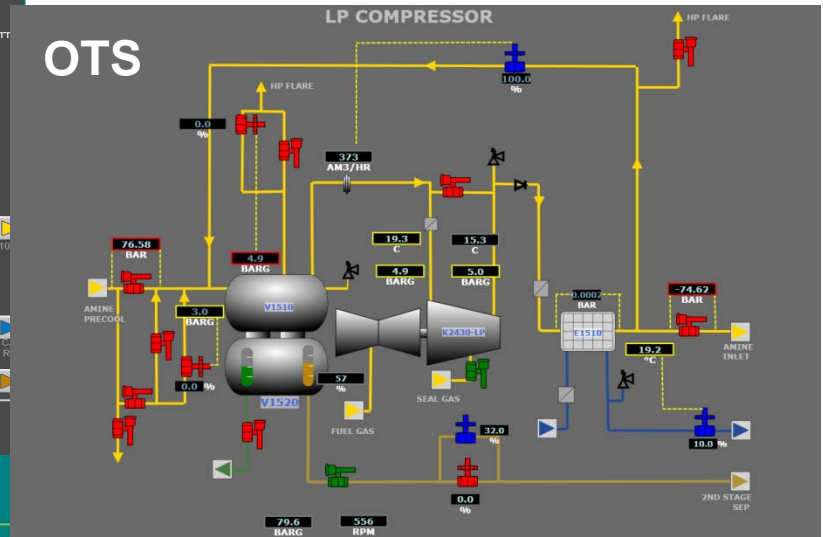
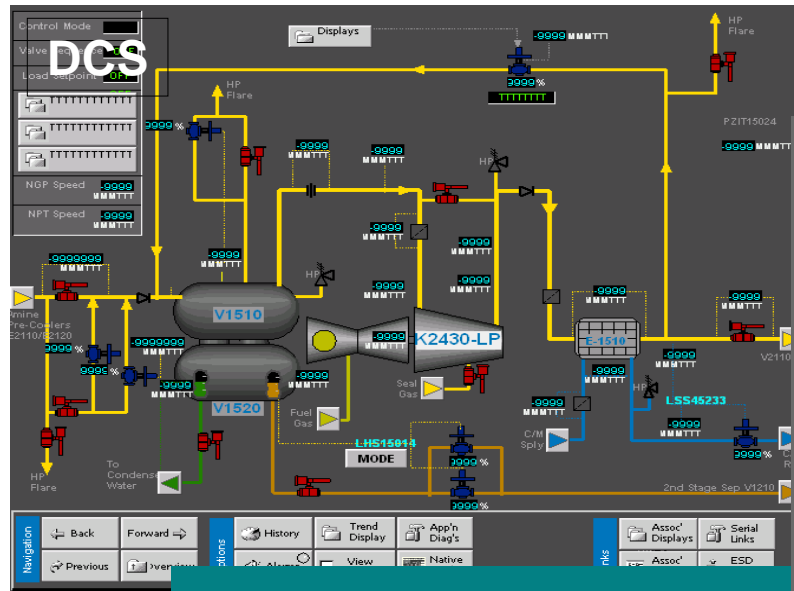


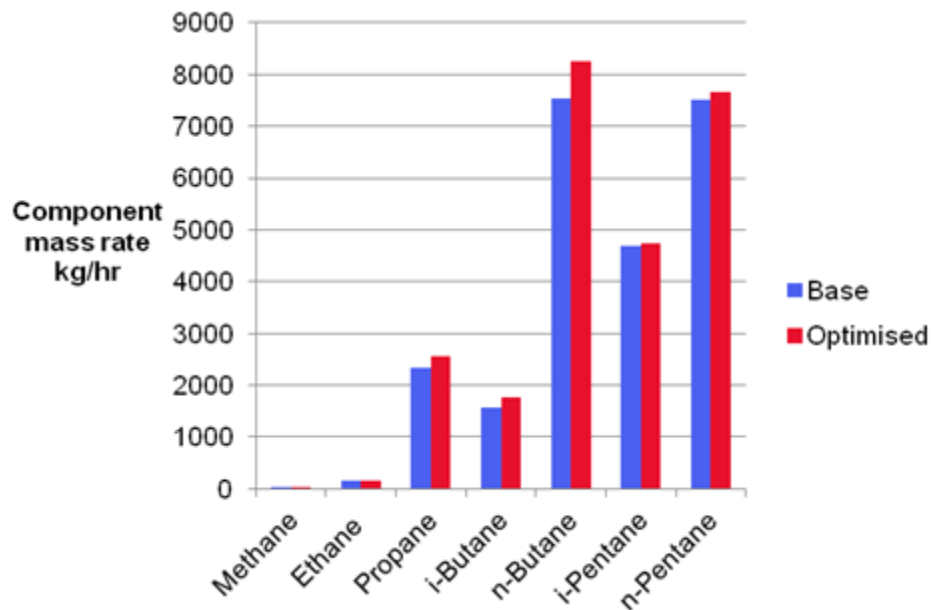
Results:

- mercury specifications - hydrocarbon export
- Points - the mercury concentrates.
- Risk of mercury dropout - risk to personnel
- Optimum location of mercury removal units
- metallurgical reviews

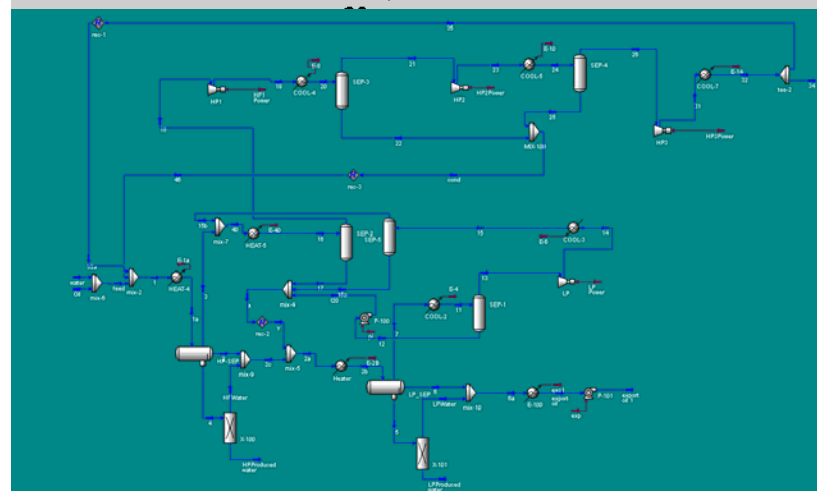
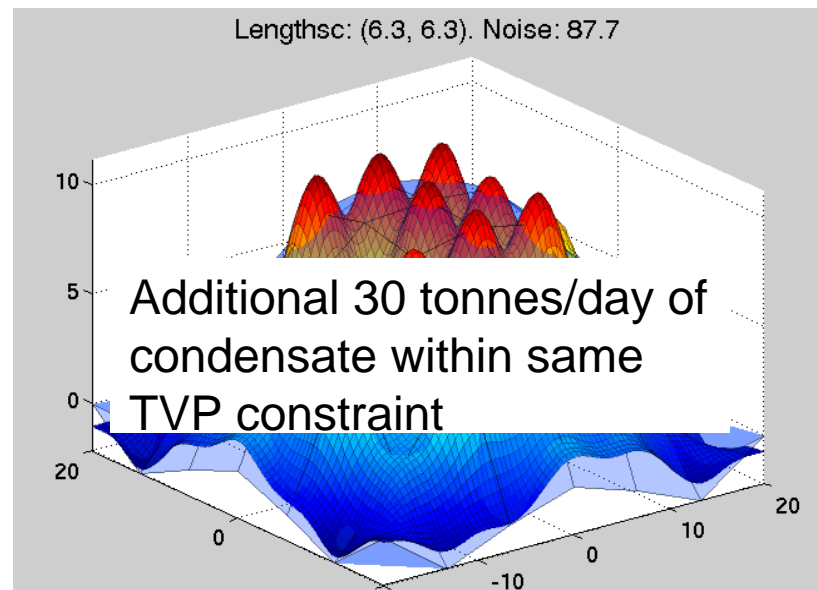


New Tools and Products - OTS





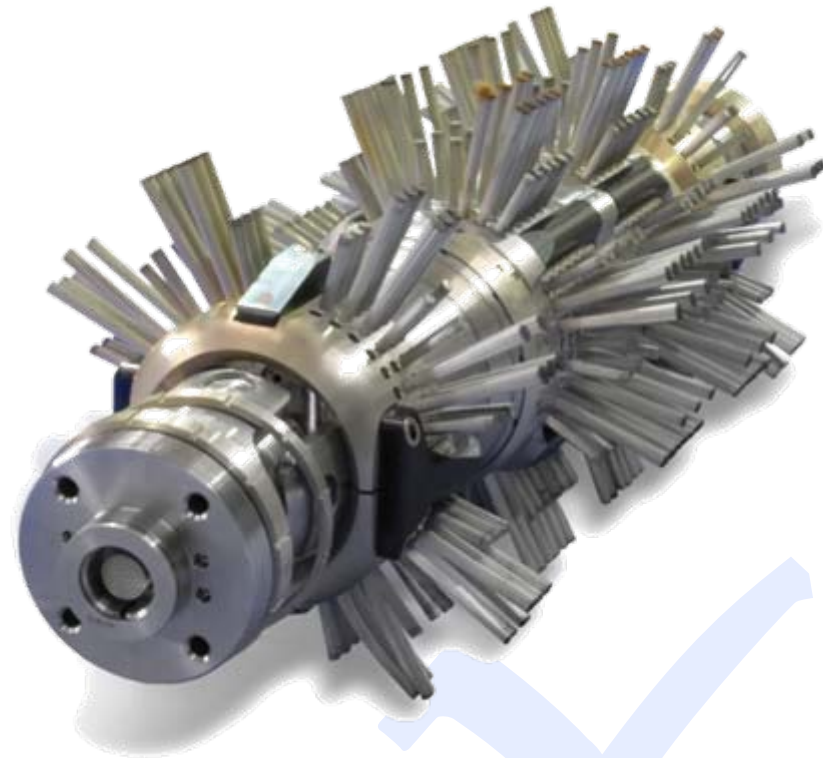
- Product Recovery Optimisation
- Five variable Temperatures, two Pressures
- Maximise Propane Plus in product crude within the same TVP constraint



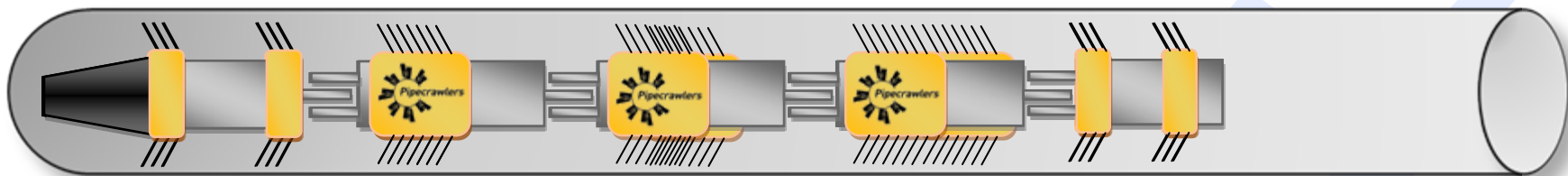


PIPECRAWLERS - “pigging the unpiggable”

- Onshore and offshore
- 6” to 60” Diameter
- Vertical risers, pipelines and piping
- Complex geometry
 - 1.5D bends
 - Wyes
 - Tees
- Oil, Gas, Multiphase, Water
- No flow or through-flow in production
- 100°C product temperature
- 300 bar product pressure

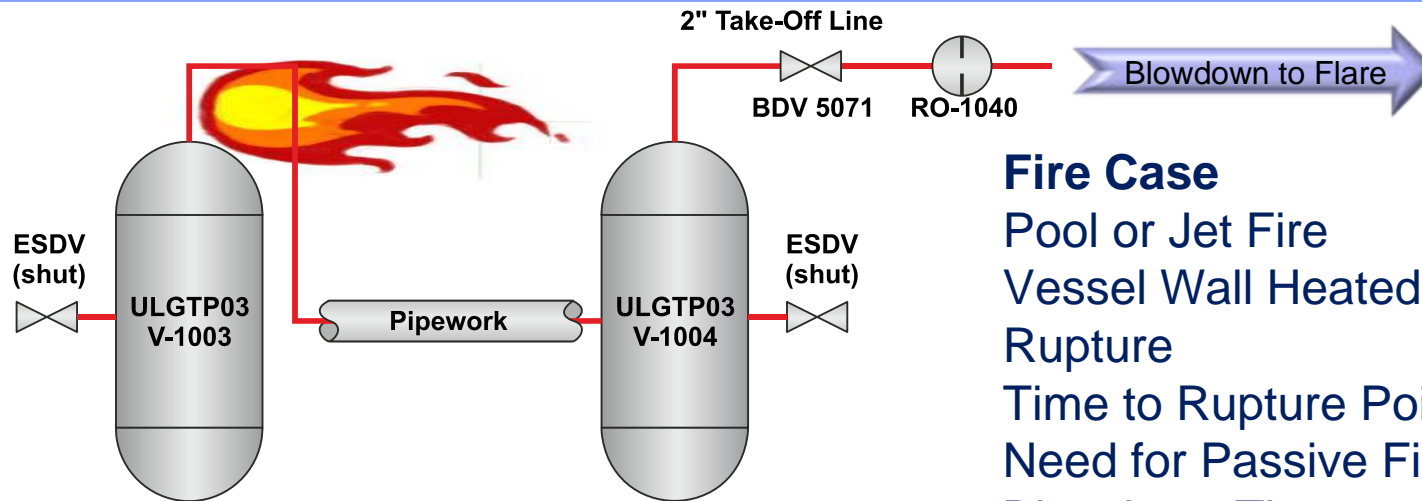


- Inspections
 - MFL
 - UT
 - Calliper
 - Video
 - Sonar
 - Weld inspection
 - IMU
- Cleaning
 - Brush
 - Jetting
 - Chemicals
- Interventions
 - Wax and Hydrate plug dispersal
 - Stuck pigs
 - Testing and isolation plug installation



DEPRESSURING AND BLOWDOWN TOOLS

Fire and Adiabatic Cases



Fire Case

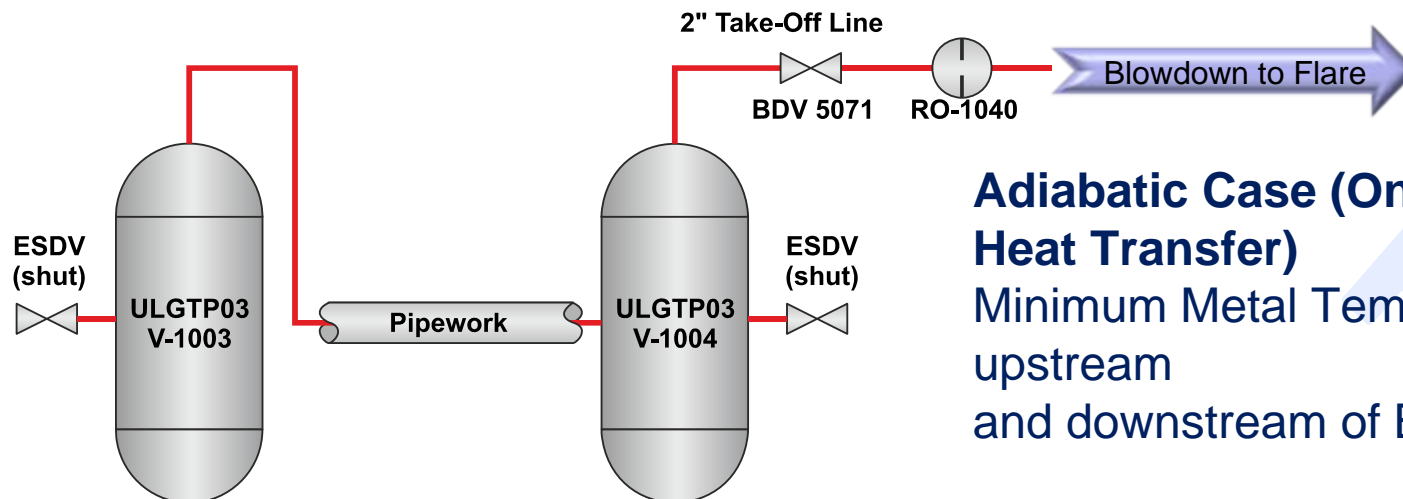
Pool or Jet Fire

Vessel Wall Heated To Point of Rupture

Time to Rupture Point

Need for Passive Fire Protection

Blowdown Time



Adiabatic Case (Only Ambient Heat Transfer)

Minimum Metal Temperature - upstream

and downstream of BDV

ADEPT Area Development Planning Tool

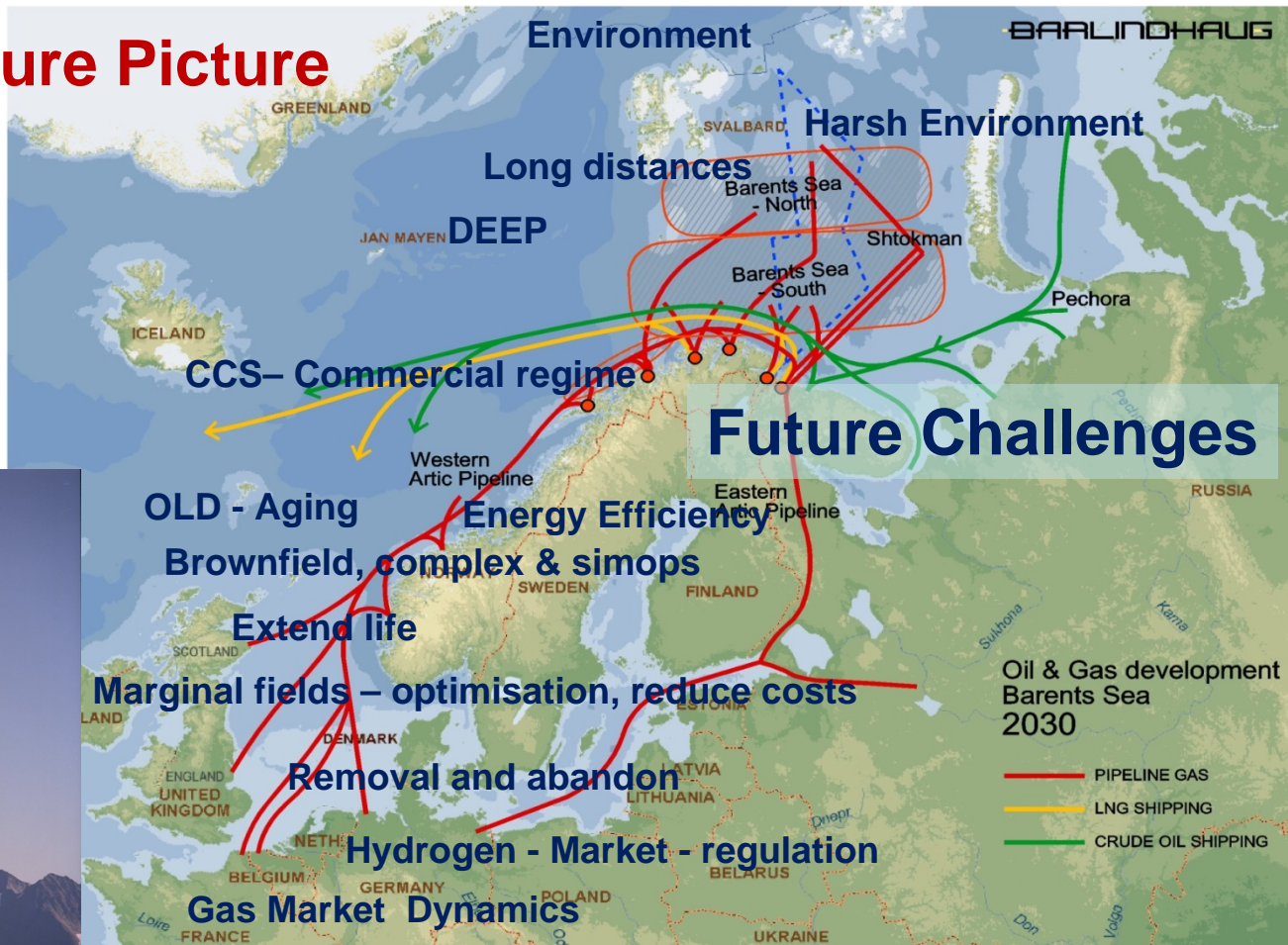
- An overall facility summary
- CAPEX for Onshore, Topsides, Substructures, Bridges, Pipelines & Risers, Subsea
- OPEX
- DRILLEX

Client A	Field A Feasibility Study FPSO with WI	J7413 19/08/2005
		Geographical Area Norway & Baltic
Legend Pipelines: Gas (Red) Oil (Green) T and P Phase (Blue) Water Injection (Purple) Gas Injection (Orange) Gas Lift (Yellow) Wells: Production (Black) Water Injection (Blue) Gas Injection (Orange) Gas Lift (Yellow)		Economic Parameters Exchange Rate: £/€ 1 Currency: £
CAPEX Breakdown <ul style="list-style-type: none"> ○ Topsides □ Substructure ▒ Subsea ▓ Pipelines (& Risers) ■ Mob/Demob 		Maximum Design Rates Oil: bopd 25000 Gas: MMscfd 160 Produced water: bwpd 1000 Injection Water: MMscfd 60000 Injection Gas: MMscfd 0 Gas Lift: MMscfd 0
KEY MESSAGES User Input		Weight Breakdown Topsides: Te 3,529 Substructure: Te 19,311 Subsea: Te 5,788 Pipelines (& Risers): Te 5,937
		CAPEX Breakdown Topsides: EMM 91 Substructure: EMM 74 Subsea: EMM 87 Pipelines (& Risers): EMM 40 Mob/Demob: EMM 3 TOTAL CAPEX: EMM 300
		Costs DRILLEX: EMM 161 CAPEX: EMM 300 DECOMEX: EMM 126 Annual OPEX: EMM 28

TAJ NUMBER	ITEM	Number	Rating	Capacity	Material of	Piping	Design Conditions	Load	Size (m)	WT (T)	Total (m ² /T)	Remarks
		Off		Per Ann	Construct	Material	Temp/Press	L	W	Dr	By Wt	
11	11 - Inflow Facilities											
11.10 - 001	Production Header	1	100%	8.0	CS	CS	229 -20779	0	5.0	1.0	5.0	7.0
11.10 - 002	Test Header	1	100%	8.0	CS	CS	229 -20779	0	5.0	1.2	2.0	1.0
11.10 - 003	Subsea Control Package	1	100%	8.0	-	-	ms -20779	10	5.0	1.5	4.0	28.0
20	20 - Production Separation											
20.10 - 001	3rd Separator	2	50%	8.0	CS	CS	991 -20779	0	10.4	1.5	13.0	101.0
20.10 - 002	2nd Separator	1	100%	8.0	CS	CS	991 -20779	0	1.4	1.0	11.0	16.0
20.10 - 003	Condensate Collector	1	100%	8.0	CS	CS	991 -20779	0	8.0	2.2	2.2	36.7
21	21 - Condensate Pumping & Metering											
21.10 - 001	Condensate Export Pump	2	100%	8.0	CS	CS	229 -20779	272	3.2	1.1	3.3	3.5
21.10 - 002	Condensate Metering Skid	1	100%	8.0	CS	CS	229 -20779	0	2.6	1.1	2.3	4.9
22	22 - Gas Export Compression											
22.10 - 001	Export Gas Compressor	5	25%	8.0	CS	CS	199 -20779	0	2.0	2.0	4.0	28.1
22.10 - 002	Export Gas Compressor Suction Scrubber	5	25%	8.0	CS	CS	199 -20779	0	2.0	2.0	4.0	28.1
22.10 - 003	Export Gas Compressor Discharge Cooler	5	25%	28.1	SS	CS	208 -27340	0	6.0	8.6	17.0	3.2
22.10 - 004	Export Gas Comp Section Inlet/Outlet Valve Package	5	25%	8.0	CS	CS	199 -20779	2	6.0	8.6	17.0	3.2
23	23 - Gas Separation											
23.10 - 001	TEG Contact	4	25%	8.0	SS	SS	991 -20779	0	3.1	1.1	12.0	101.0
23.10 - 002	TEG Regen. Package	2	50%	8.0	SS	SS	229 -20779	3000	1.0	1.0	0.5	10.0
23.10 - 003	TEG Contact Heat Cooler	4	25%	8.0	SS	CS	991 -20779	0	6.0	8.0	17.0	3.2
23.10 - 004	TEG Make-up Tank	1	100%	28.0	SS	CS	15 -20779	15	4.0	2.0	4.0	17.0
23.10 - 005	TEG Make-up Pump	1	100%	1.0	SS	CS	15 -20779	0	6.0	8.0	17.0	3.2
24	24 - Gas Metering											
24.10 - 001	Export Gas Metering Skid	2	50%	8.0	SS	SS	229 -20779	0	2.0	1.1	3.0	11.0
25	25 - Produced Water Reception											
25.10 - 001	BWPD											
25.10 - 002	Reception Pump	2	100%	58.0	CS	Duplex	275 -20750	30	2.5	1.2	1.4	1.0
25.10 - 003	Reception Water Filter	1	100%	8.0	CS	Duplex	35 -20750	0	6.1	1.0	8.0	1.2
26	26 - MEG Regeneration											
26.10 - 001	MEG Regen. Package	1	100%	8.0	SS	SS	35 -20750	160	37.0	14.0	4.7	8.0
26.10 - 002	Lean MEG Tank	1	100%	400.0	LTCO	LTCO	35 -20750	0	16.0	1.0	4.0	4.0
26.10 - 003	Rich MEG Tank	1	100%	400.0	LTCO	LTCO	35 -20750	0	16.0	1.0	4.0	4.0
26.10 - 004	MEG Injection Pump	2	100%	8.0	LTCO	LTCO	208 -20750	15	4.0	2.0	4.0	17.0
26.10 - 005	Rich MEG Transfer Package	2	100%	8.0	LTCO	LTCO	35 -20750	15	1.5	1.0	8.0	1.0
40	40 - Cooling Medium											
40.10 - 001	CCM Breakwater Cooler	8	14%	21.0Mw	Ti	LTCO	12 -20750	0	6.0	1.2	2.0	14.1
40.10 - 002	Conveyer Pump	1	25%	17.0	LTCO	LTCO	12 -20750	3000	4.0	1.0	1.0	1.0
40.10 - 003	Expansion Vessel	1	25%	17.0	LTCO	LTCO	12 -20750	0	8.0	1.7	3.2	9.5
40.10 - 004	Water Package	1	100%	8.0	SS	LTCO	12 -20750	0	2.0	2.0	4.0	6.5



Future Picture



**Genesis Oil & Gas Consultants
Thank You**



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