



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

From Oil to Petrochemicals

Application Examples

05/11/2005

SO / MFP

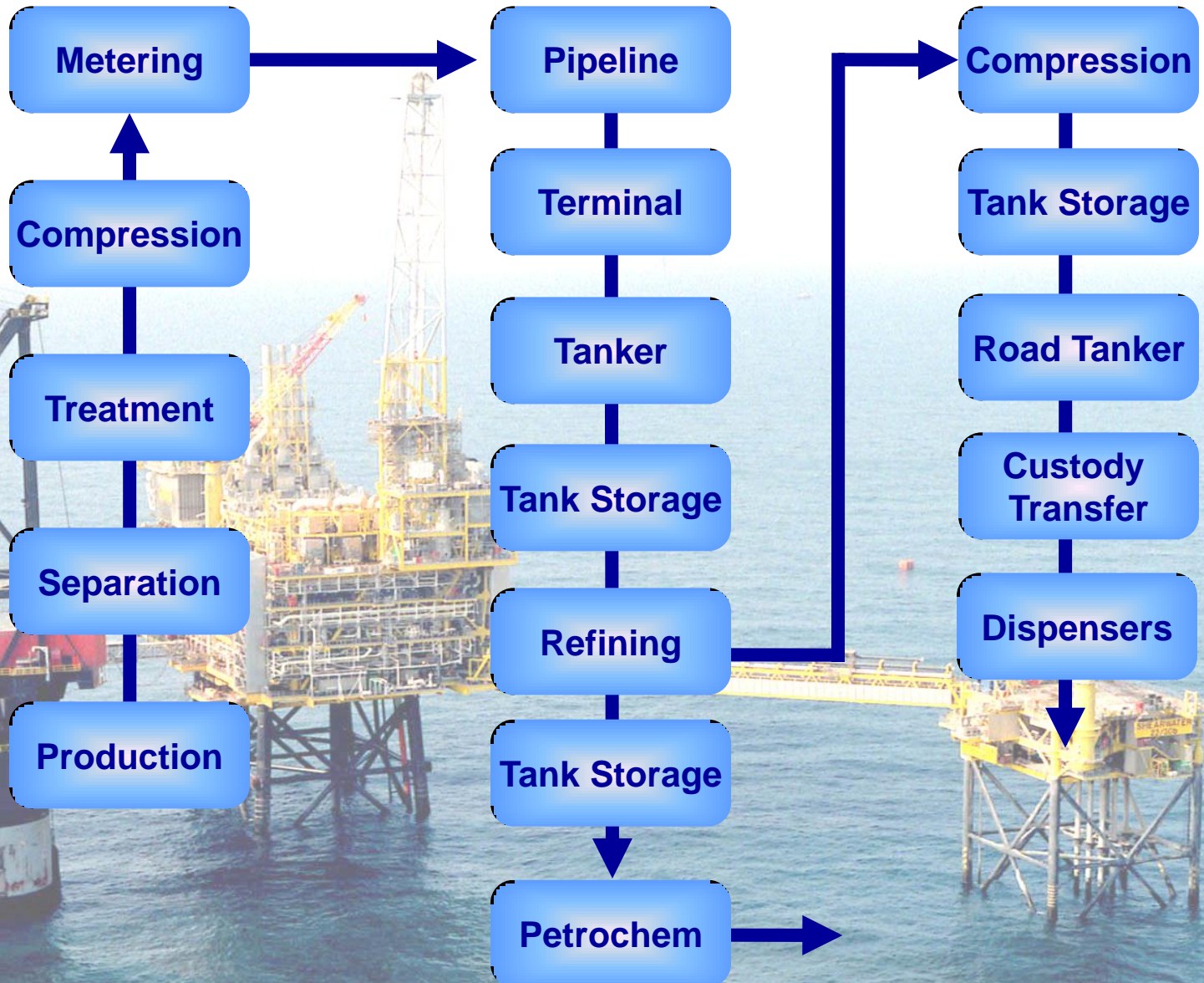
Slide 1

Endress+Hauser 

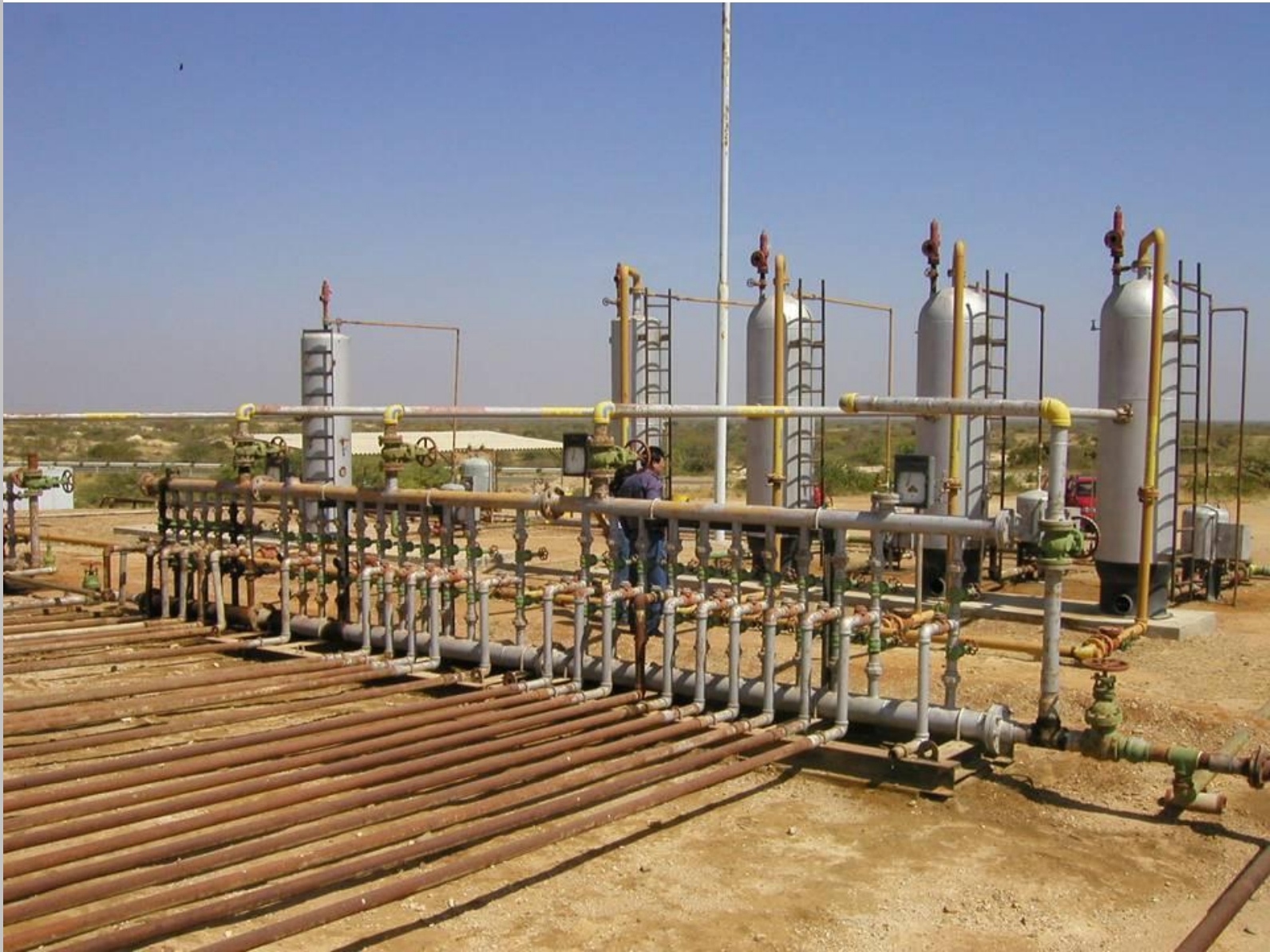
People for Process Automation

Oil & Gas Logistics

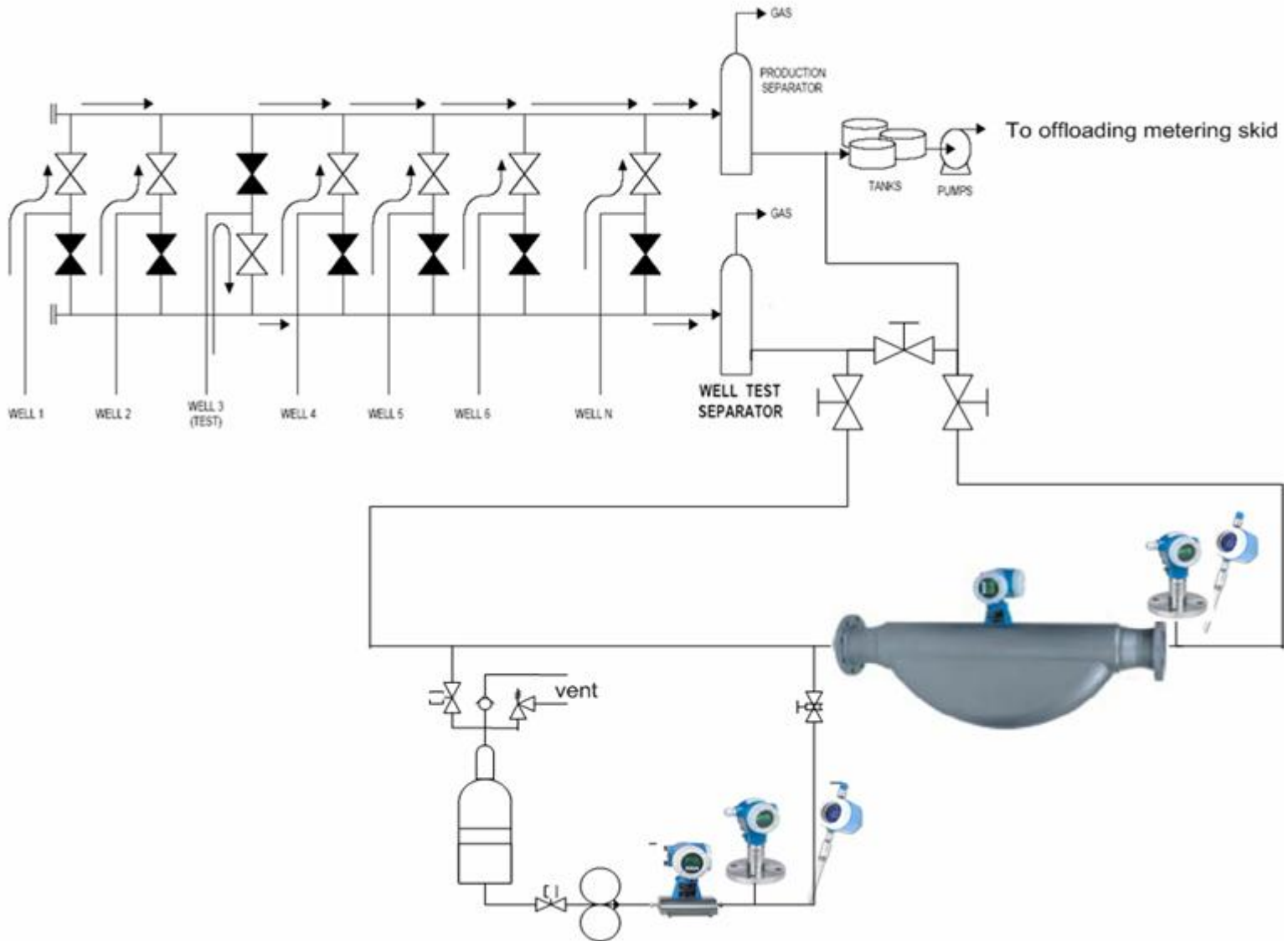
With courtesy of Shell



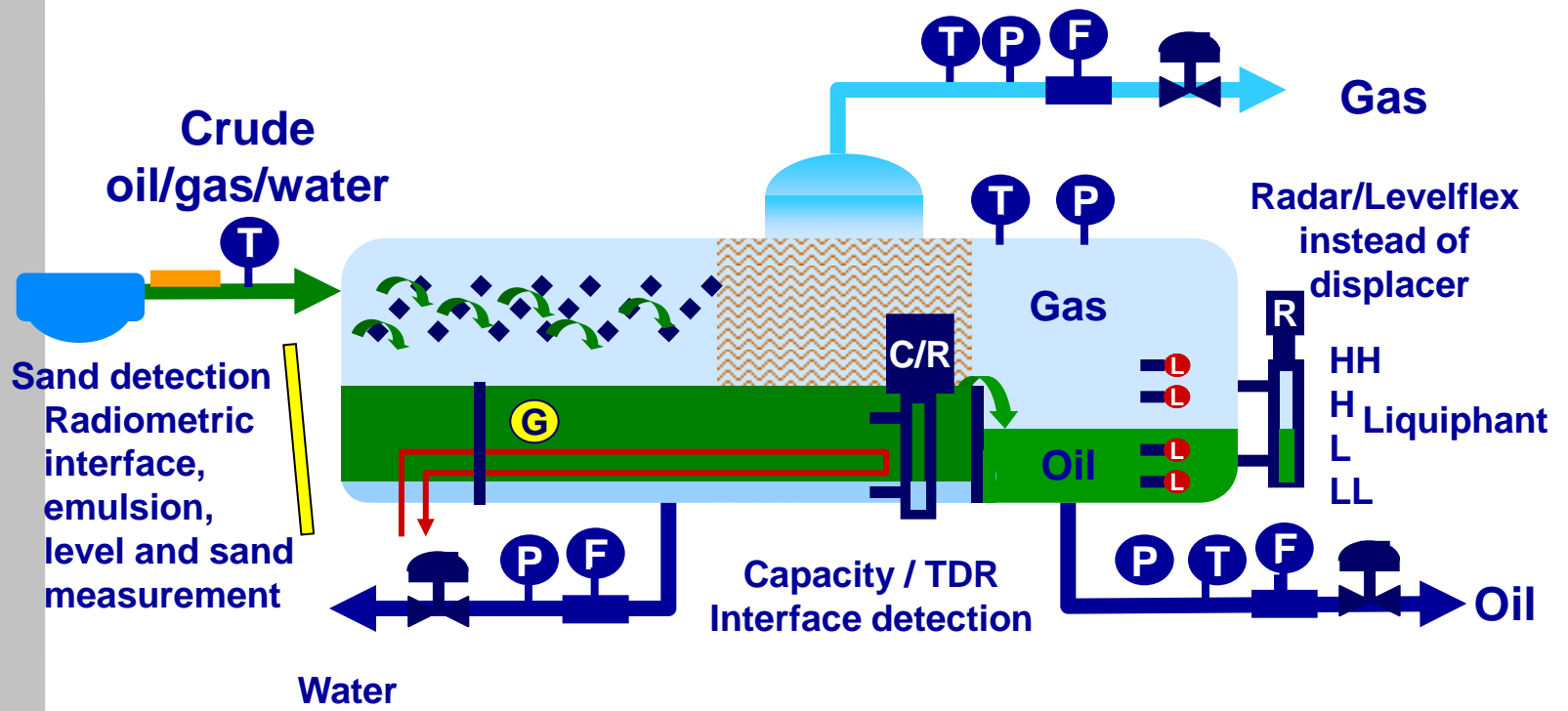
Production – Gathering Station



Net oil computations for i.e. well testing



Separator



Oil & Gas: Crude Oil at Test Separator



- Instrument: Promass 83F
- Industry: Oil & Gas
- Fluid: Crude Oil
- Reason:
 - Flow measurement after test separator
 - Replacement of U-tube flowmeter
 - Self-draining
- Benefits:
 - No maintenance
 - Reliable measurement
 - (No clogging!)

Injection on separator

Demulsifier injection flow measurement with Promass



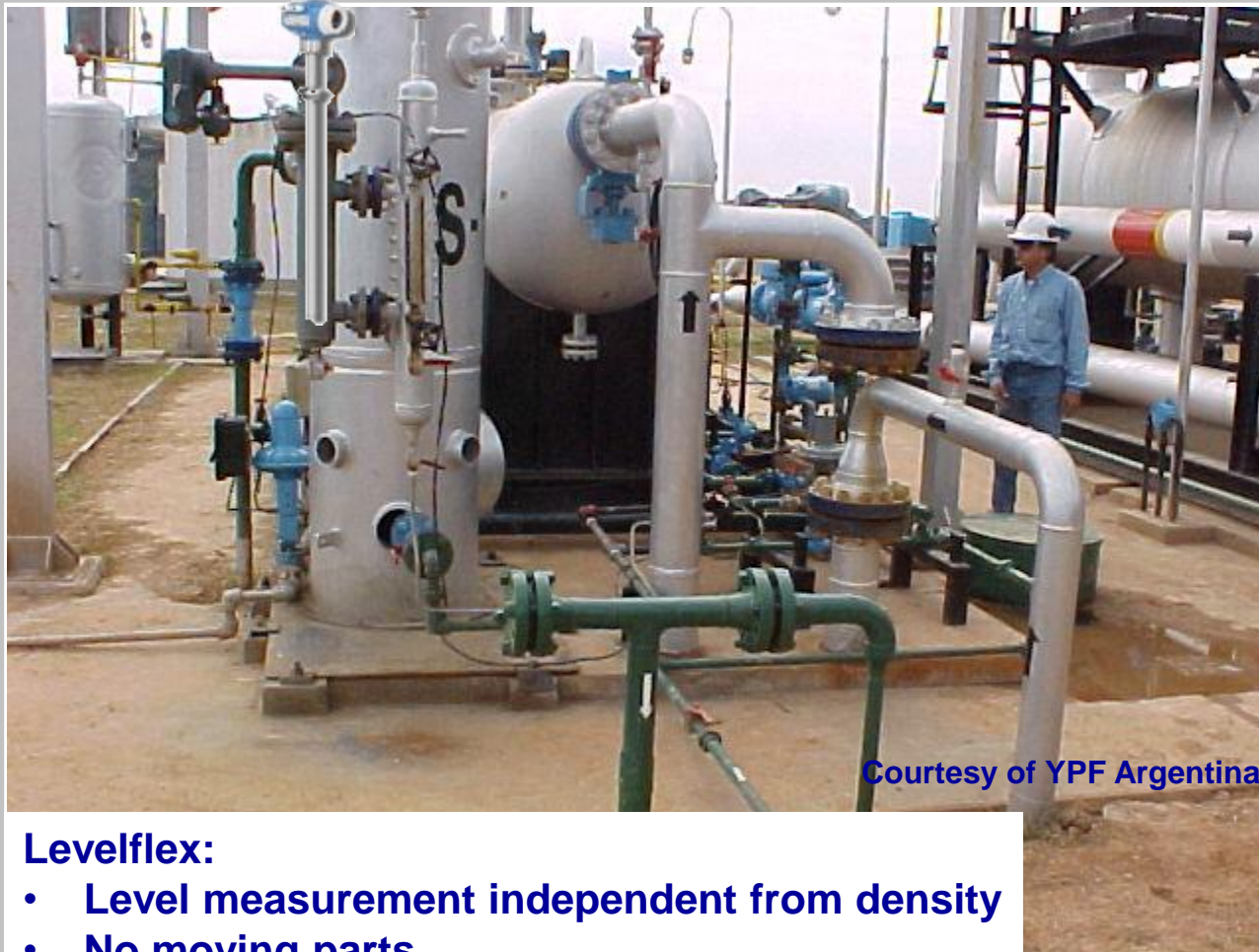
High pressure version

Just a piece of pipe

No inlet- outlet pipe required

**Promass M
at satellite station, Argentina**

Typical displacer replacer application



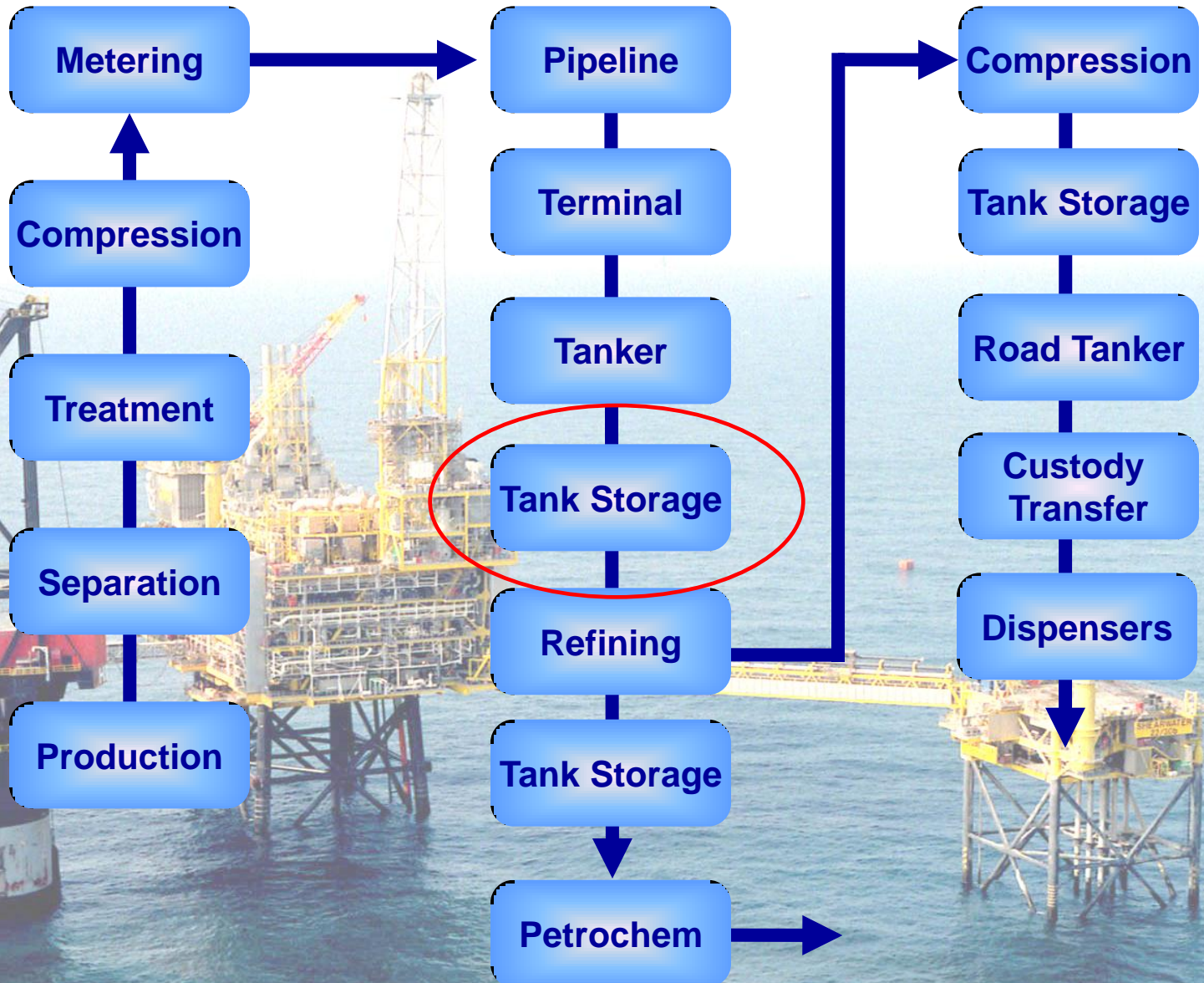
Courtesy of YPF Argentina

Levelflex:

- Level measurement independent from density
- No moving parts
- Factory pre-calibrated, no field calibration
- Transmitter change in operation
- Second line of defence

Oil & Gas Logistics

With courtesy of Shell



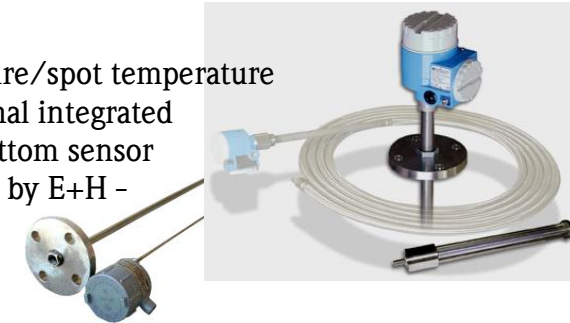
TG Product Overview

- Most complete product basket for Tank Gauging
- The right solution for all applications

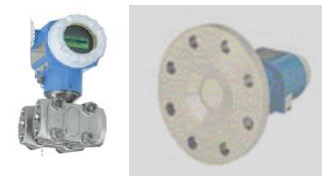


Level Measurement
Technology
- made by E+H -

Average temperature/spot temperature
with optional integrated
water bottom sensor
- made by E+H -



Pressure sensors for hydrostatic
density or vapor pressure
- made by E+H -



System Components
- made by E+H -

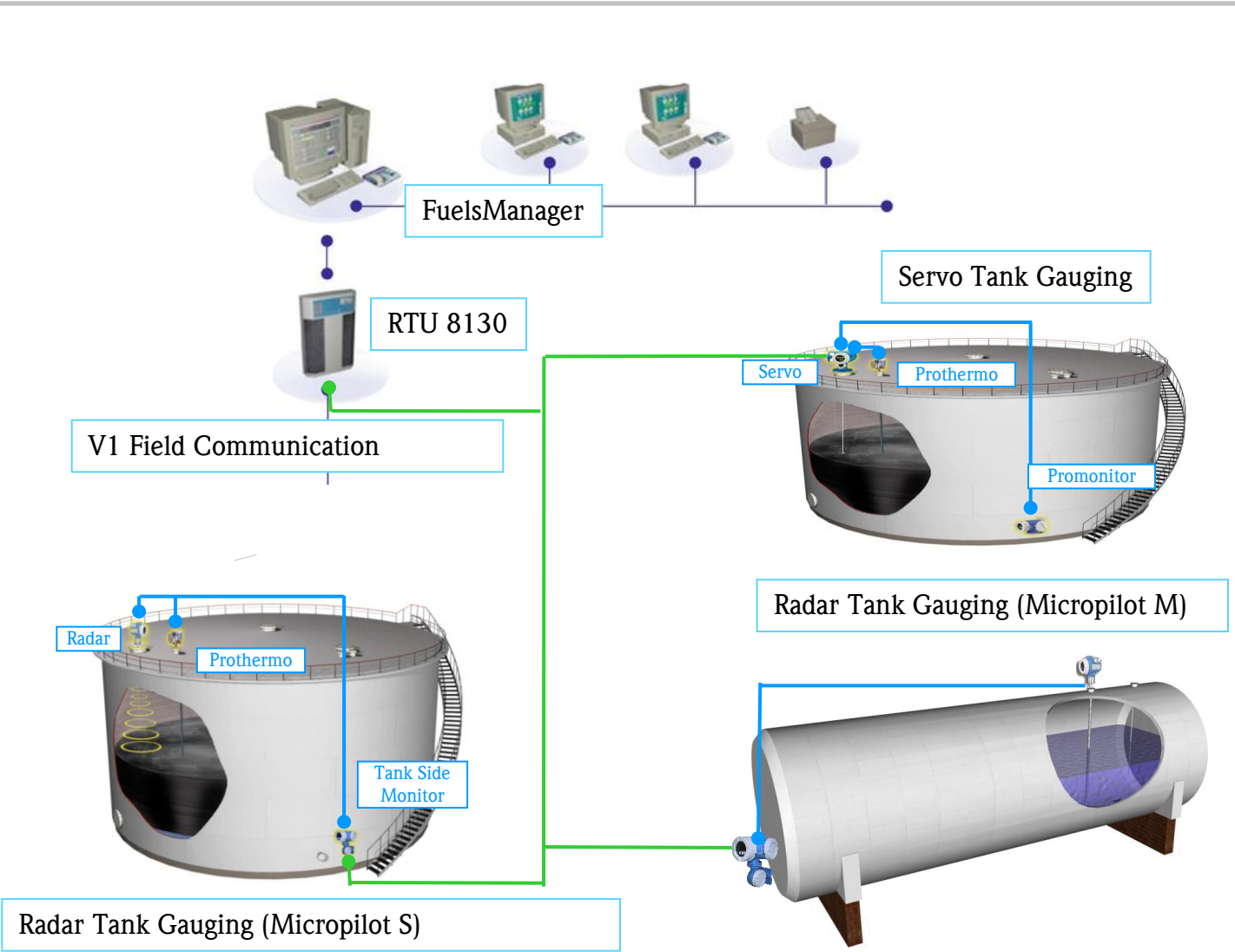


Software
- made by E+H -



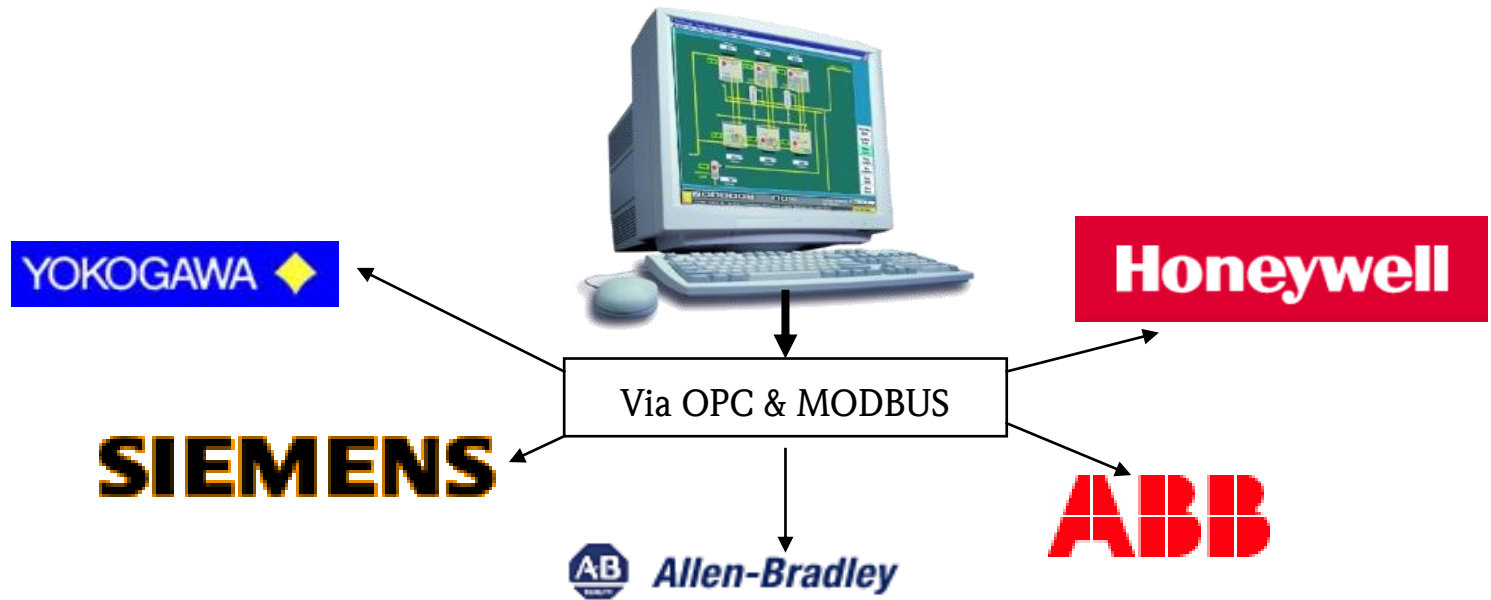
Our standard solution...

Radar and Servo on the same bus: V1



FuelsManager - Total Connectivity

- FuelsManager can connect to various DCS and PLC systems -giving you to total control over your processes!



Applications in Tank Gauging - Tüpras

■ Tüpras Izmit Refinery Tank Gauging / Turkey



System Modernization:

- Refinery tank farm
- 114 tanks
- Level, temperature, pressure
- Inventory Management System



■ Largest refinery in Turkey

- 1.8 mio cbm storage capacity for crude oil, intermediates and products



FMP 40 in LPG Application at Unique Gas Thailand

- FMP40 (Coaxial version) is working perfectly in LPG bullet tank.



Applications in Tank Gauging - Marubeni

Marubeni

■ Nantong Petrochemical Harbor Storage Co., Ltd / Shanghai

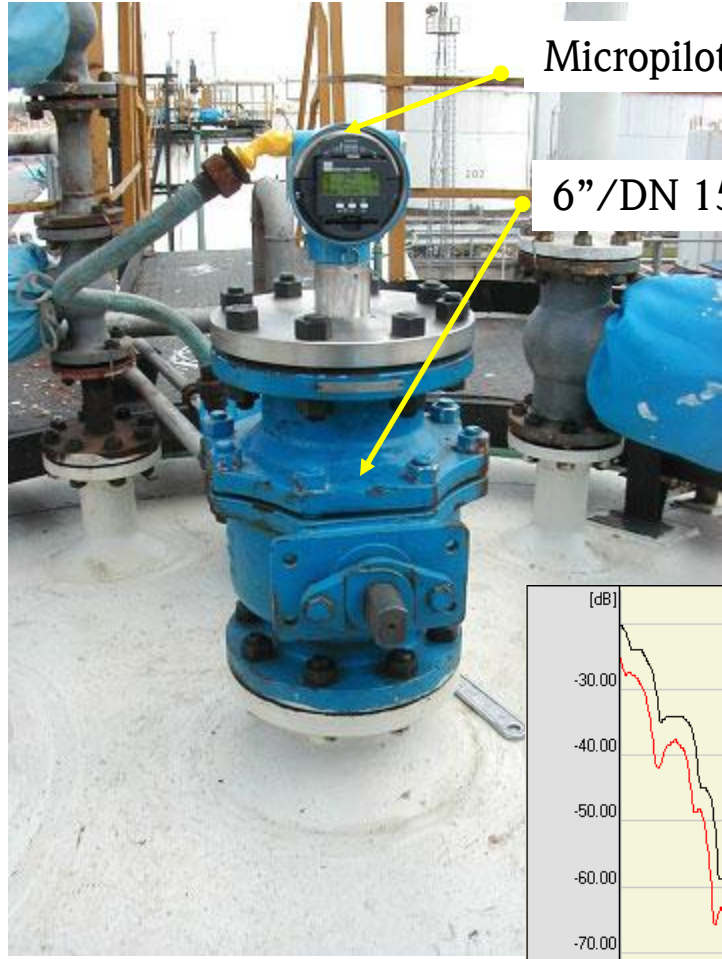
■ 3 LPG tanks with Micropilot M - FMR 232

- height 12m
- pressure 16 bar
- 6" stilling well
- ball valve



Applications in Tank Gauging - Marubeni

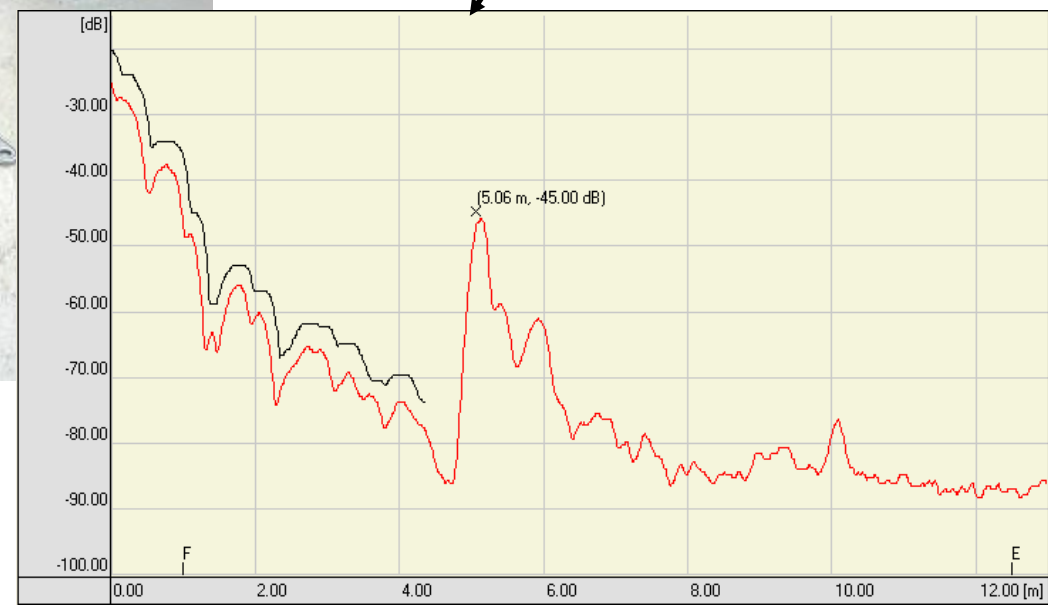
Marubeni



Micropilot M - FMR 232

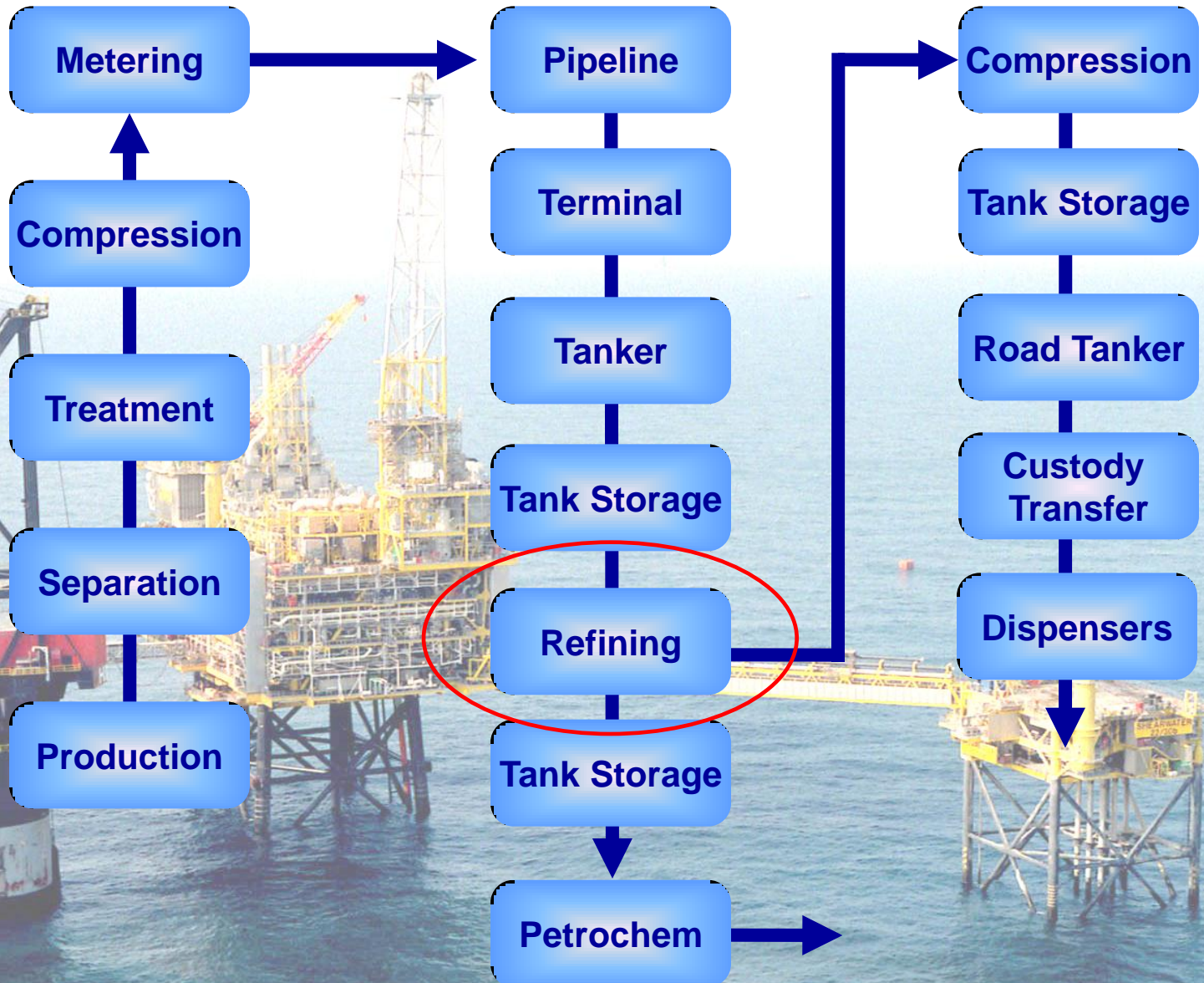
6"/DN 150 Ball Valve

Name	Value
measured value	64.659 %
measured dist.	5.064 m
tank shape	stilling well
medium property	DC: < 1.9
process cond.	standard
echo quality	36 dB
present FEF	14.700 dB
blocking dist.	1.000 m
application par.	not modified
present error	

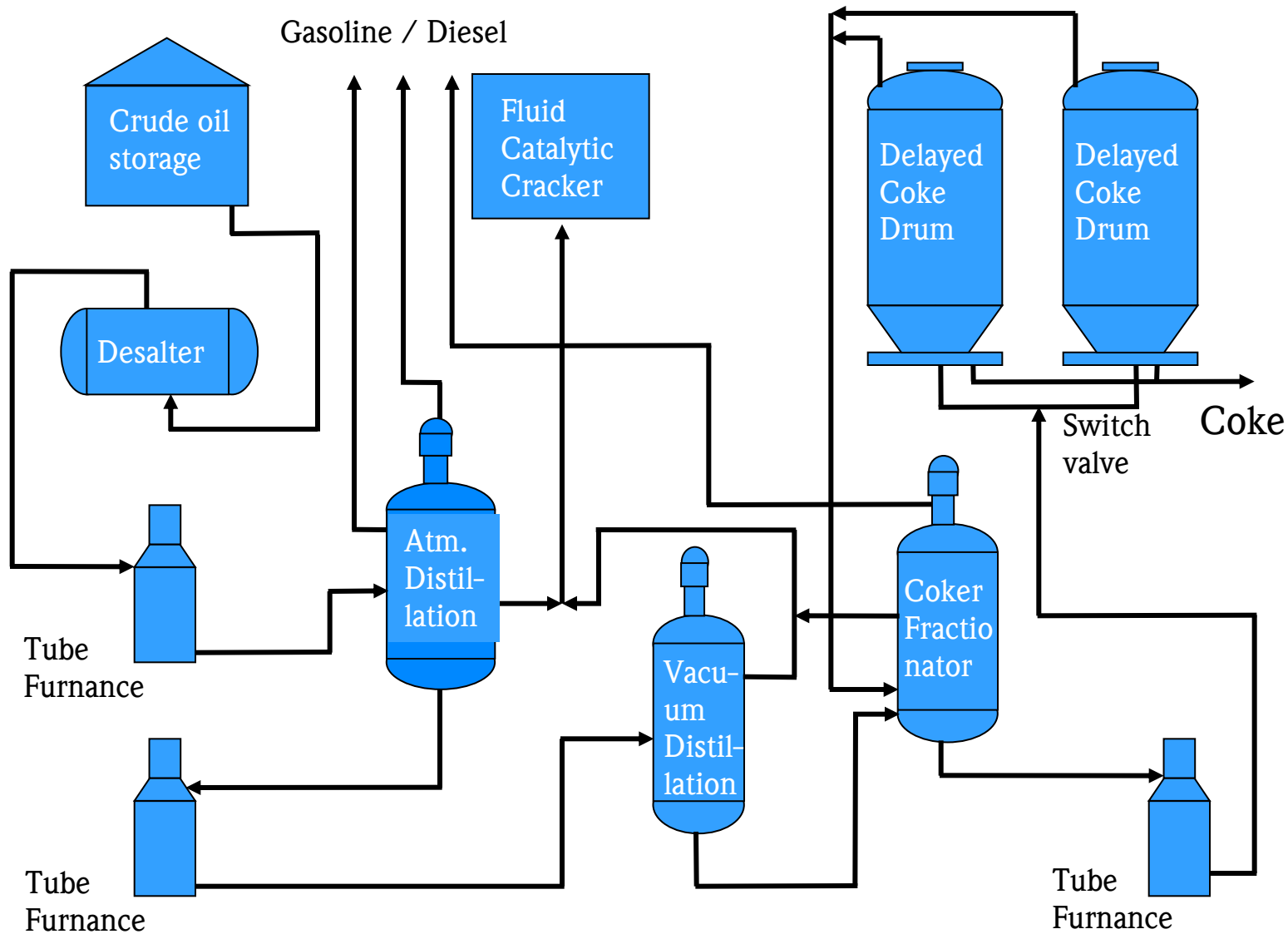


Oil & Gas Logistics

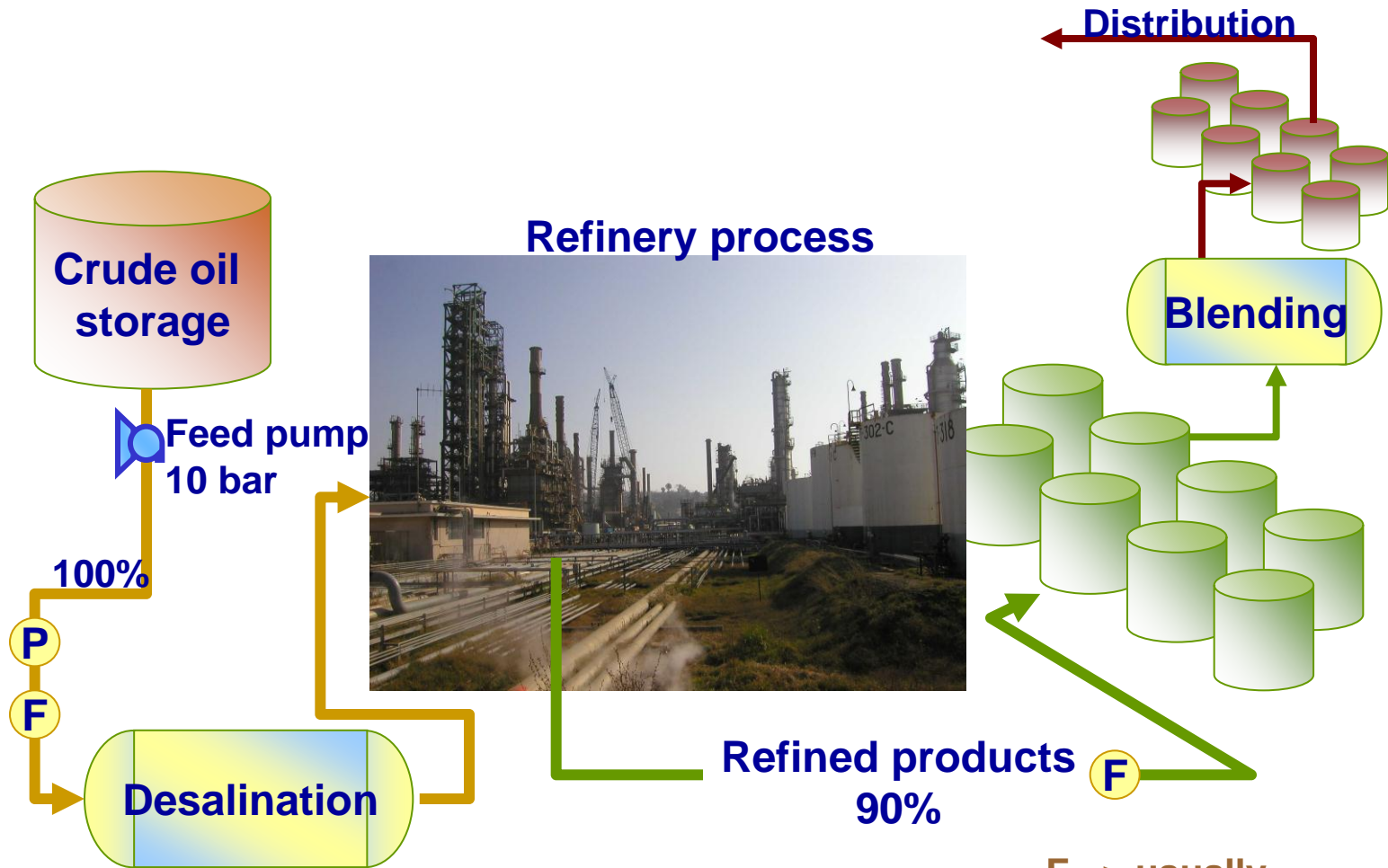
With courtesy of Shell



Refinery - Oil & Gas



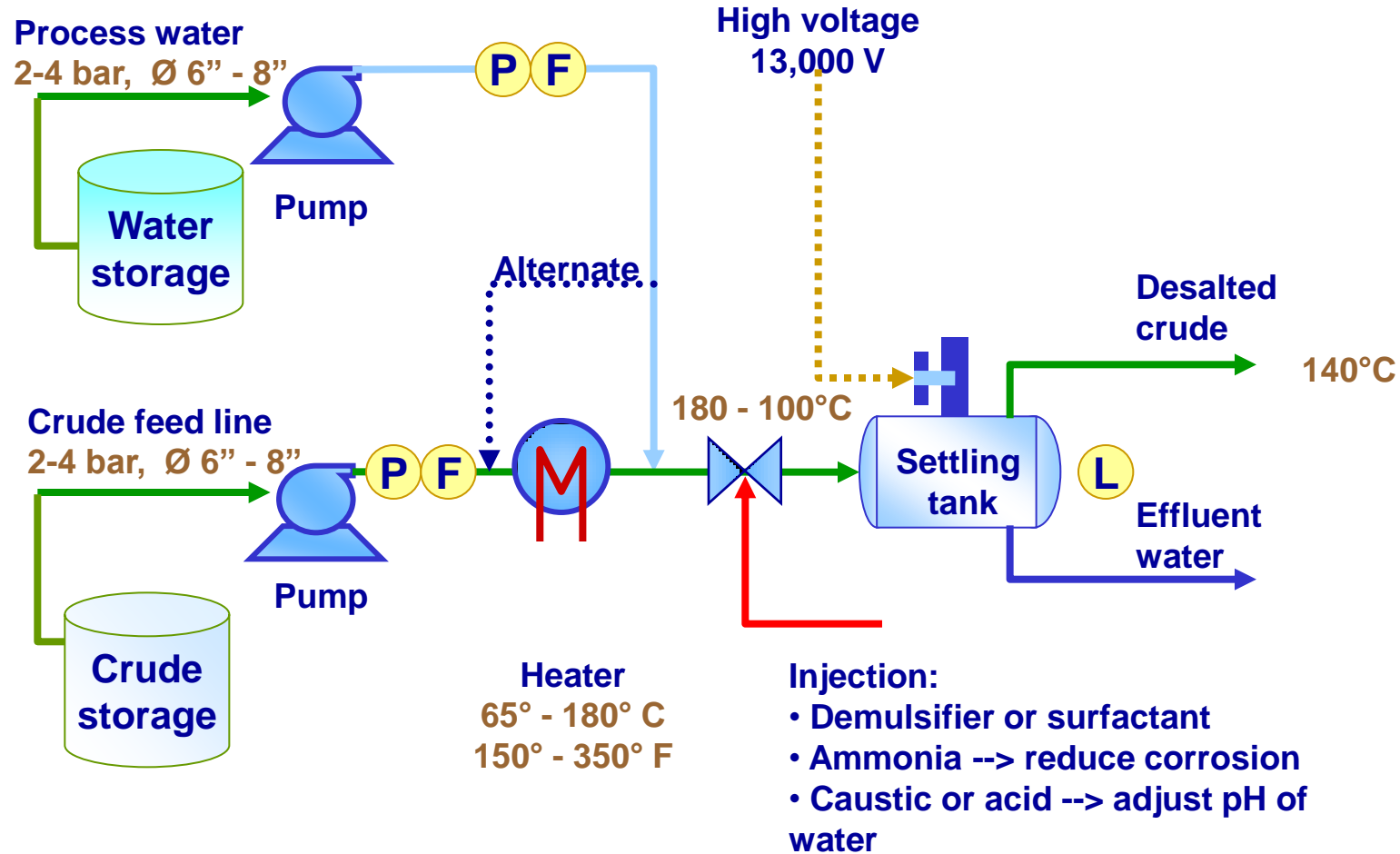
Mass balance, desalination



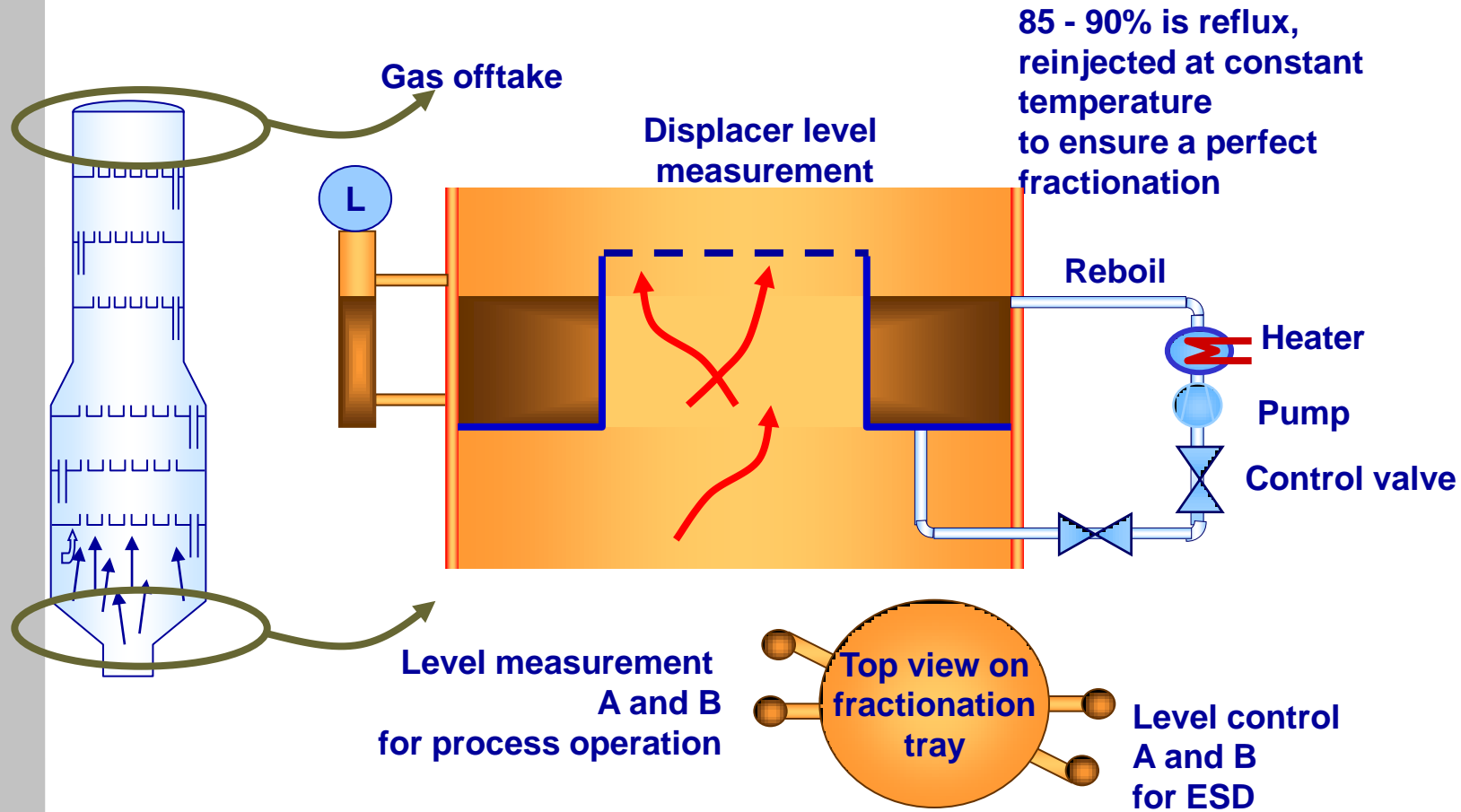
F => usually DP orifice plate
tendency for coriolis for mass balance

F => usually turbine meter

Electrostatic desalting



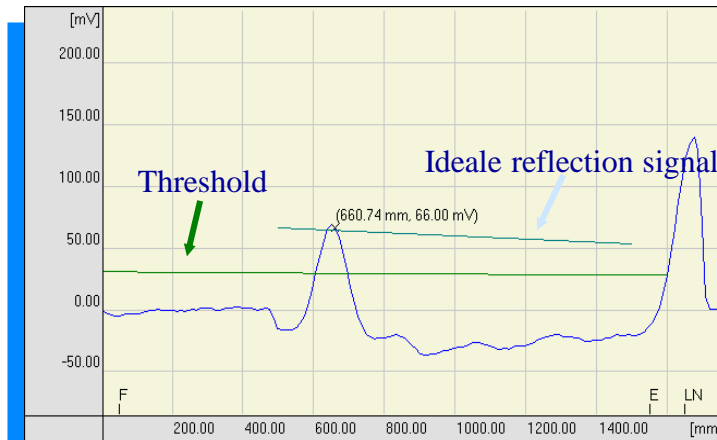
Distillation side offtake



Distillation side offtake

Reliable level measurement

- ✓ down to DC $\geq 1,4$
- ✓ Independent of nozzles
- ✓ independent of foam
- ✓ independent of bubbles
- ✓ independent of boiling surface



And before ?

..... Previous displacer got frequently stuck
in sump !



Shell & DEA Oil GmbH



Gasoline tower

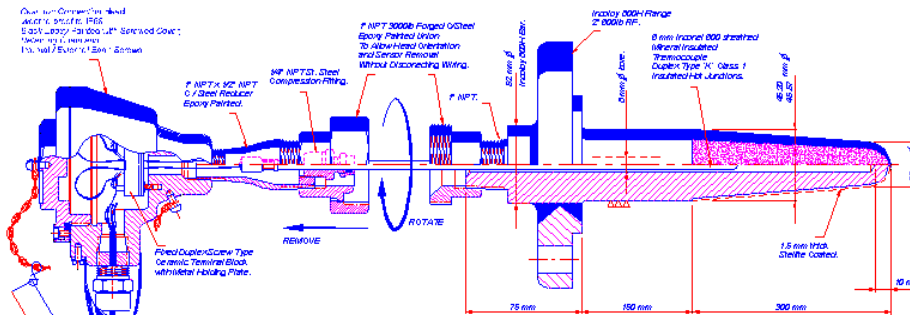
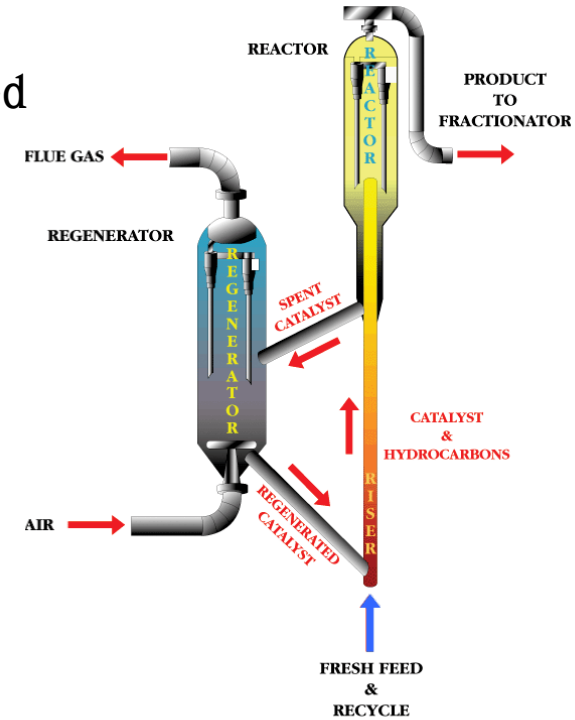
Courtesy of Shell/DEA refinery
Heide, Germany

Cracking

Conversion of molecule structure.
Heavy long hydrocarbon molecules are cracked
To light short ones.

Three different principles:

- Thermal cracking
- Catalytic cracking
- Hydro cracking



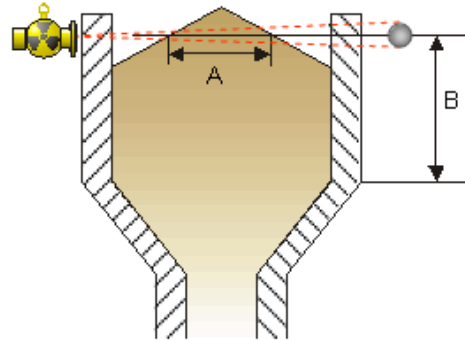
- Cast Iron connection head
- Weatherproof IP68
- Incoloy 800H Flange, 2" 600lb RF
- Stellite 6 coated thermowell - best wear resistance
- For product flow with high erosion at 450°C - 500°C
- Insert 6mm INCONEL 600 sheathed MI Thermocouple
- Duplex type K, Class 1 Thermocouple



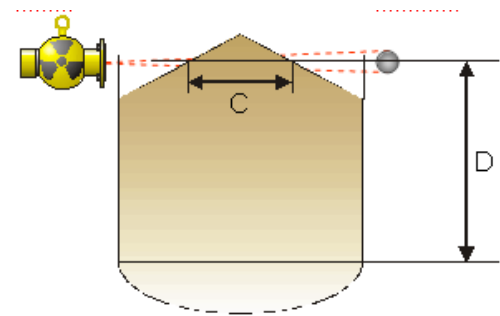
Cracking

UOP licensed process in CCR

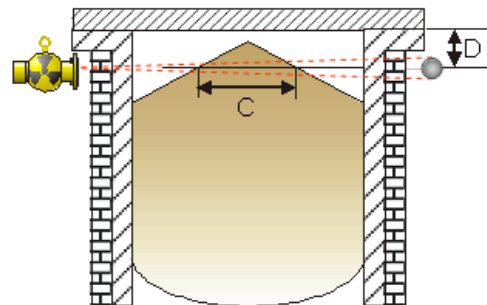
Lock Hopper Zone 1+2



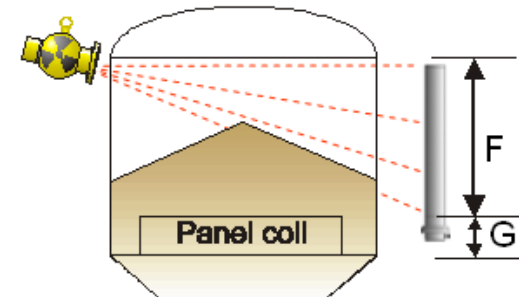
Disengaging Hopper



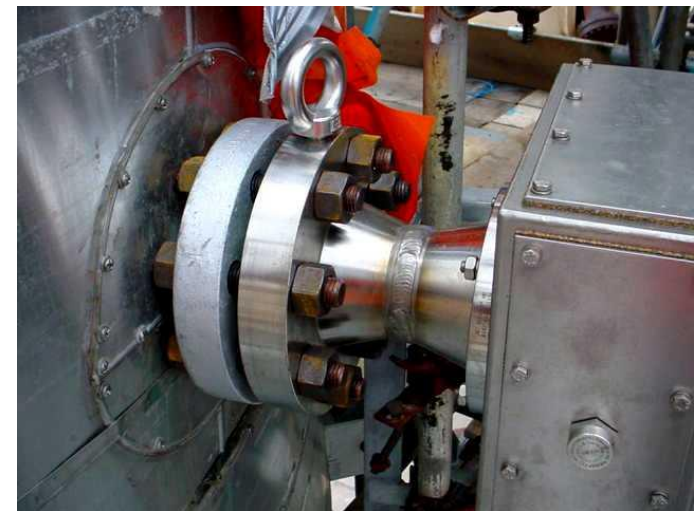
Reactor Reduction Zone



Surge Hopper



Temperature measurement in de-sulphurisation



Diesel oil desulphurisation plants



Engineering Solution
TEXACO UK
Pembroke Refinery



System Tests:

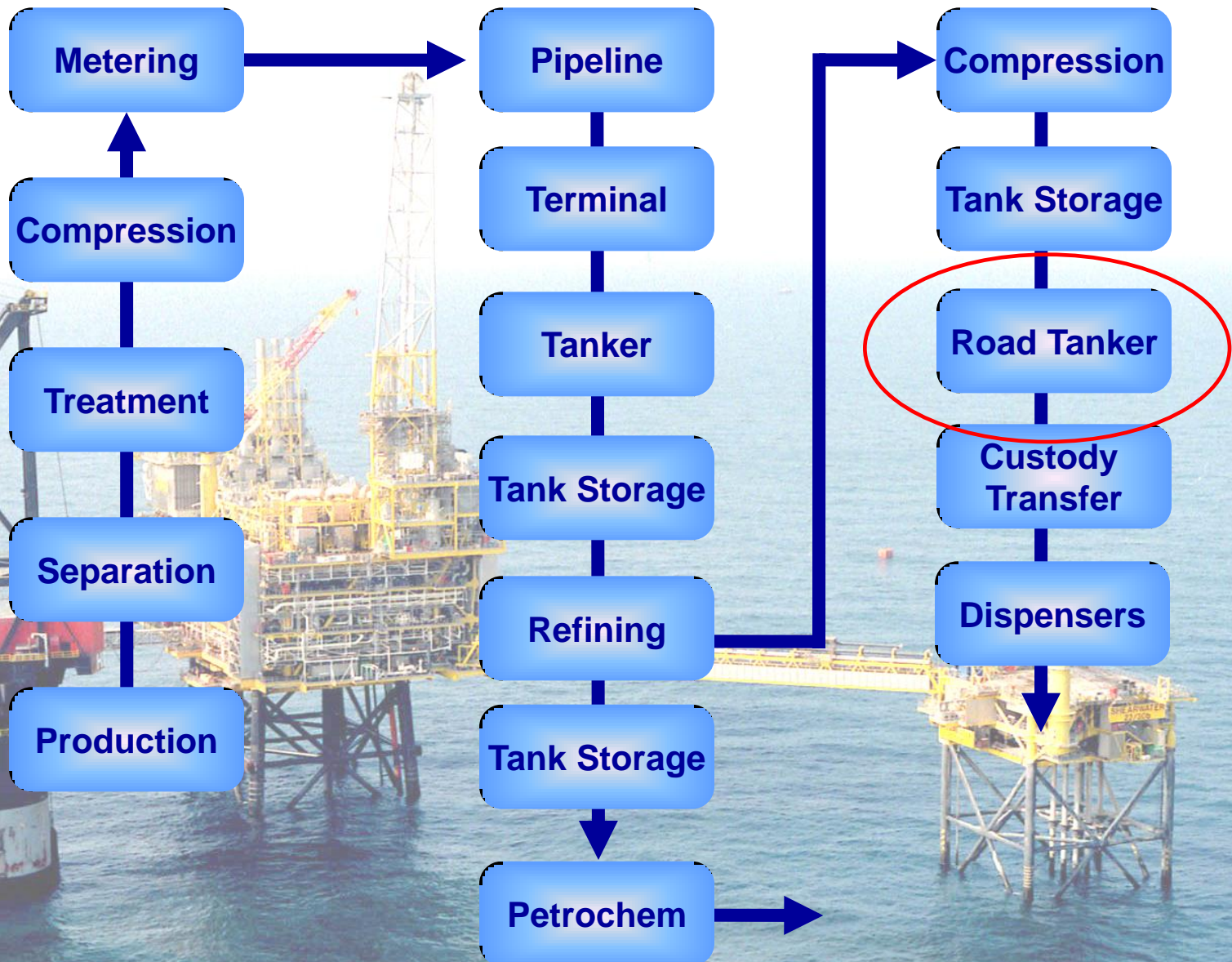
- Helium leakage test
- Pressure test certificate / 100 bar
- Material testing (pull and tensile tests)



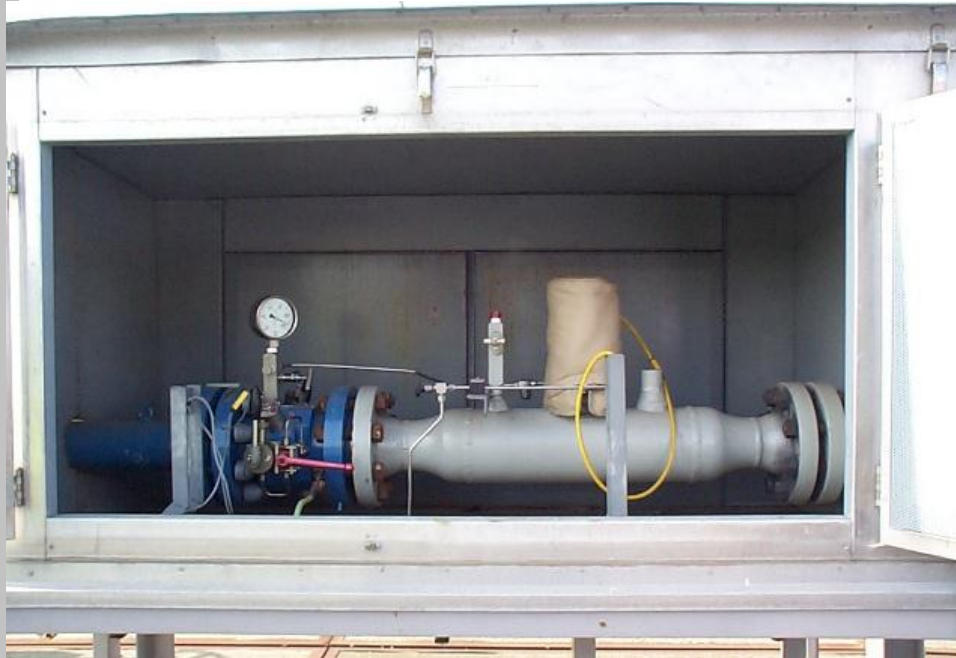
Note: The complete Texaco Test Report is on the handout CD !!!

Oil & Gas Logistics

With courtesy of Shell



Promass F, custody transfer



Traditionally served by turbines and densitometers with T compensation.



Coriolis is more cost effective to install and operate. Advanced diagnostics confirm meters operating performance

Promass F, custody transfer

Reproducibility tests critical phase ethylene

Mass flow measurement of Ethylene for custody transfer.

Replacement of turbine meter

Flow rate:	10-40 t/hr
Density:	310-350 kg/m ³
Pressure:	75-95 bar
Temperature:	10-15 deg C



Dow Chemical, Terneuzen Netherlands
08.12.1999

3" SS Coriolis meter was re-installed on ethylene line

- Calibration factor was unchanged
- Meter zero was not adjusted
- 90° elbows installed on inlet and outlet
- Performance referenced to inferred mass "system" and line balance data

BK-Gas Truck filling station



BK-Gas is a Shell subsidiary in the Netherlands

BK-gas

LPG filling station for LPG trucks



Note: The coriolis, Promass F, for custody transfer is positioned right next to an elbow and valve.

LPG in Argentina



LPG in Turkey



Promass F
Reference meter for
calibration control of PD meter

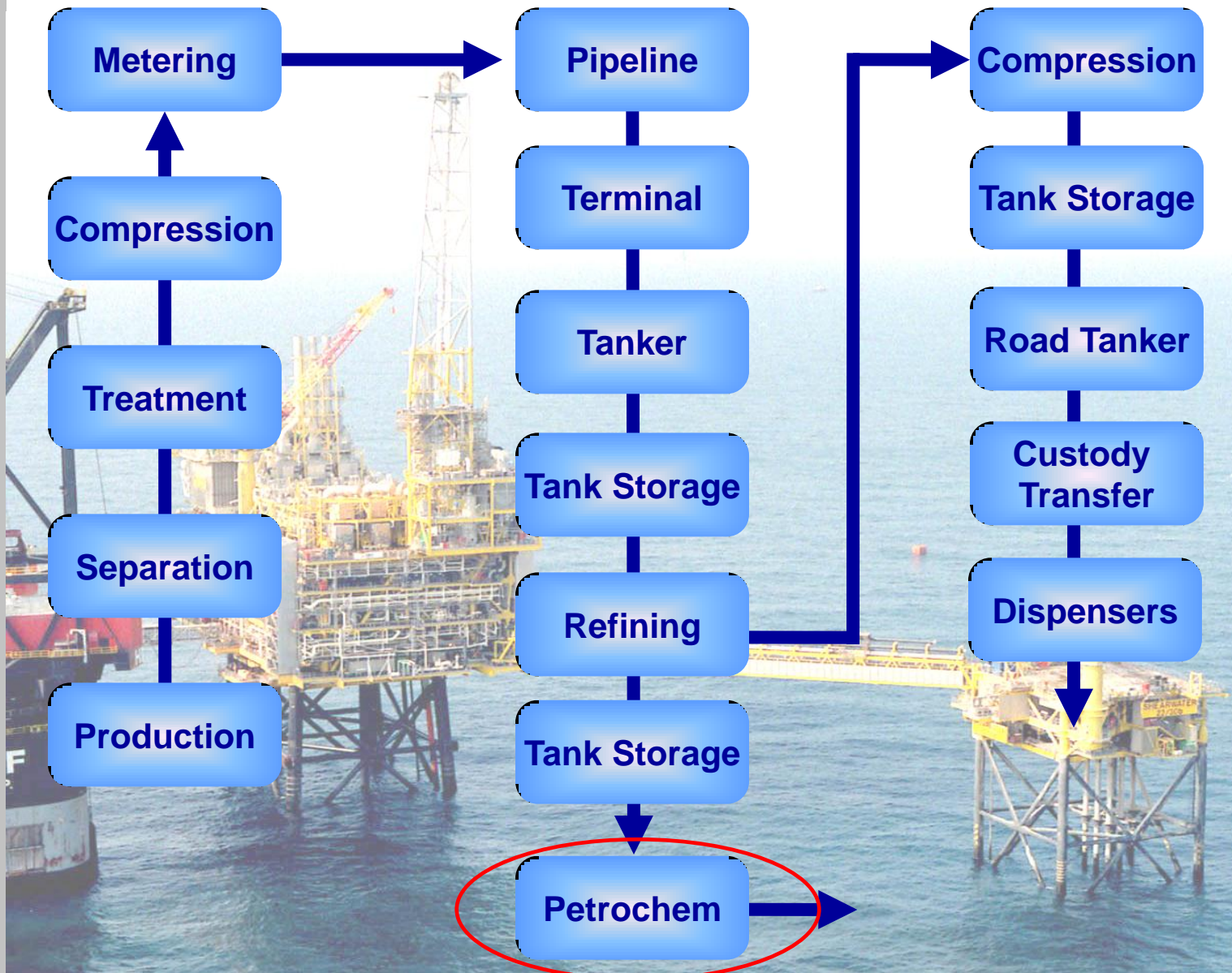
LPG in Turkey



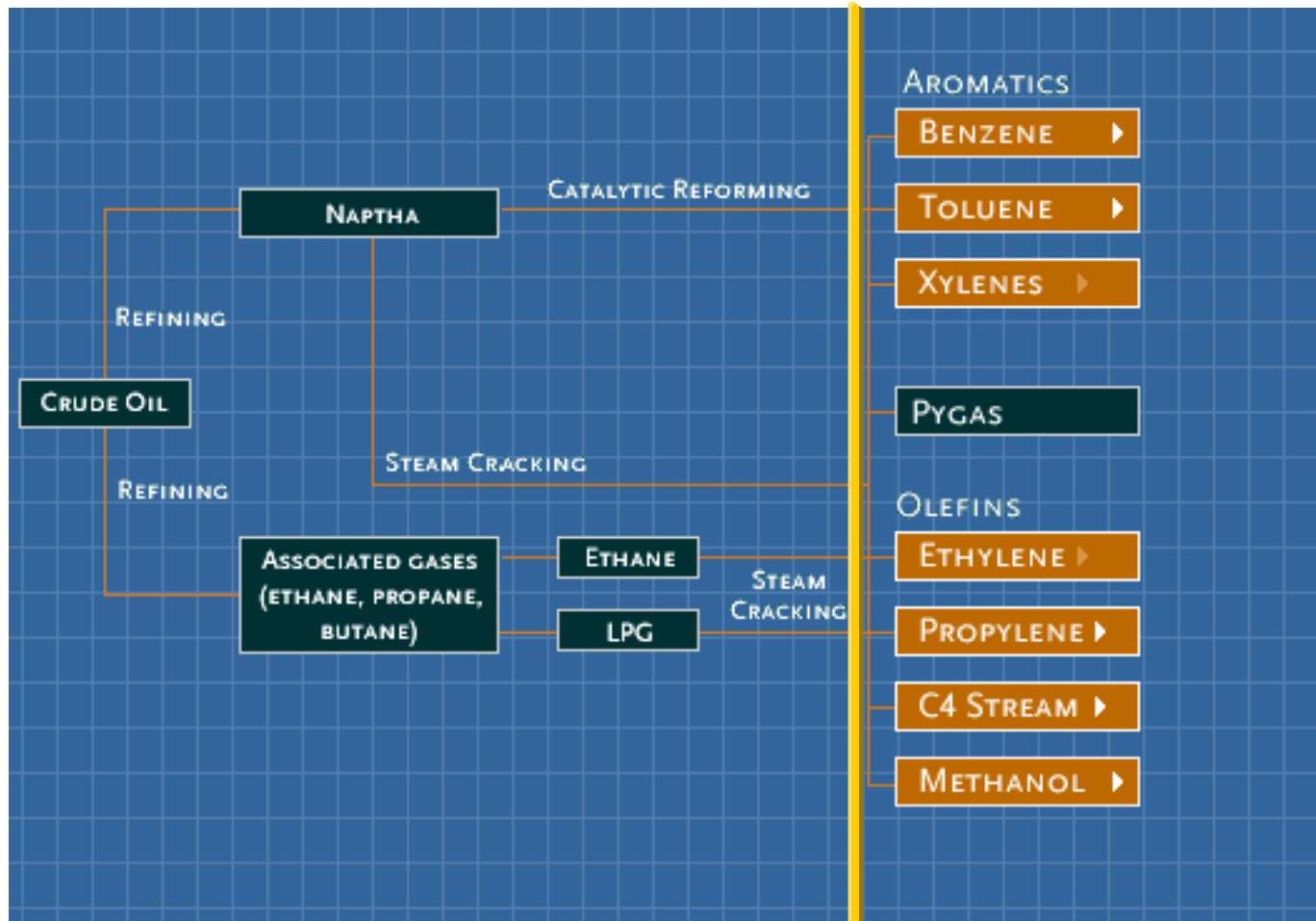
Please note: After a trial of 3 weeks we have checked the performance yesterday and found an error of 200g in 1000 kg. of LPG. As you may guess Aygaz is satisfied with the results.

Oil & Gas Logistics

With courtesy of Shell



Petrochemicals



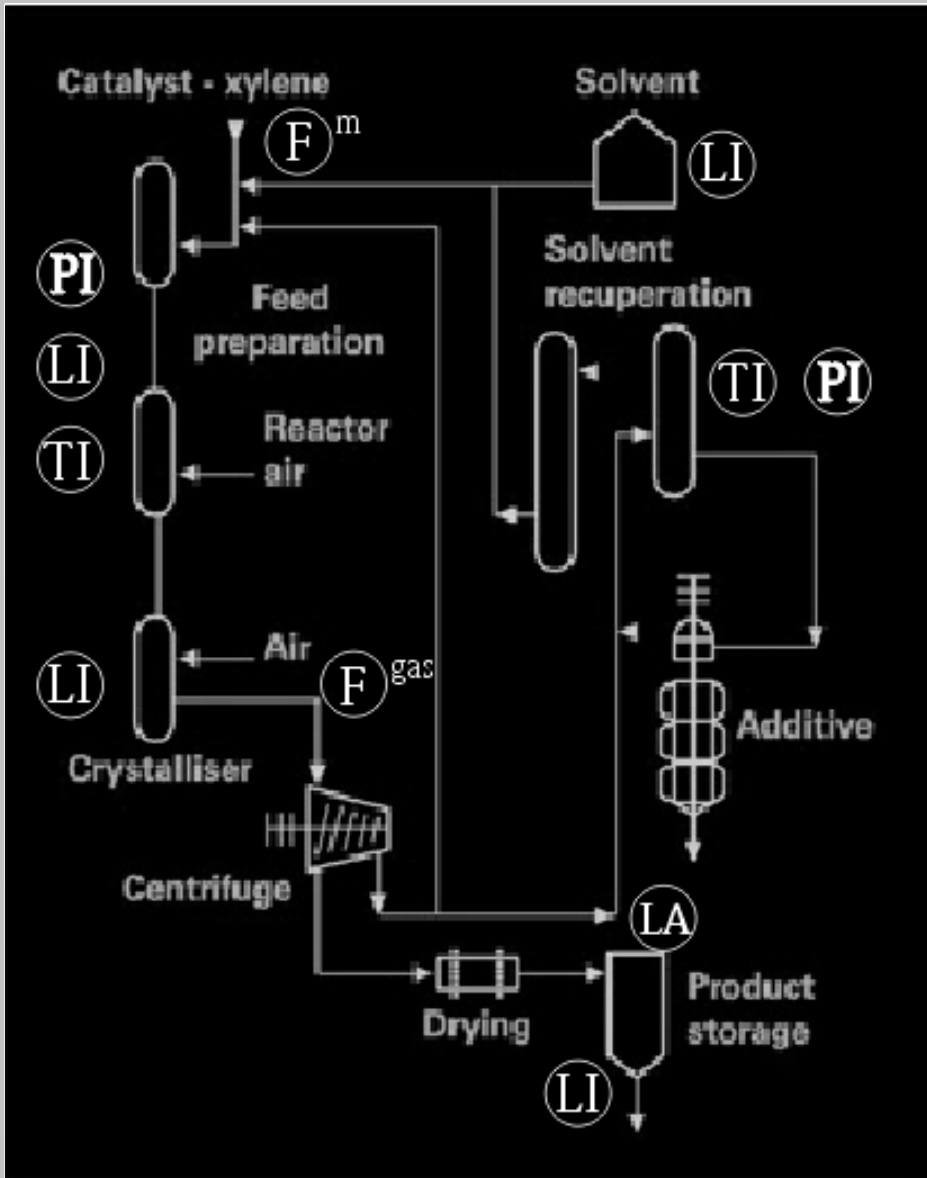
Oil & Gas



Petrochemical

About 250 chemicals are petrochemical products.

Terephthalic Acid



Step 1:

PX + catalyst + oxygen + acetic acid



CTA
(after centrifuge and drying = white powder = crude terephthalic acid)

The solvent is recovered in a distillation unit.

CTA - level measurement in oxidation reactor



Stage 1

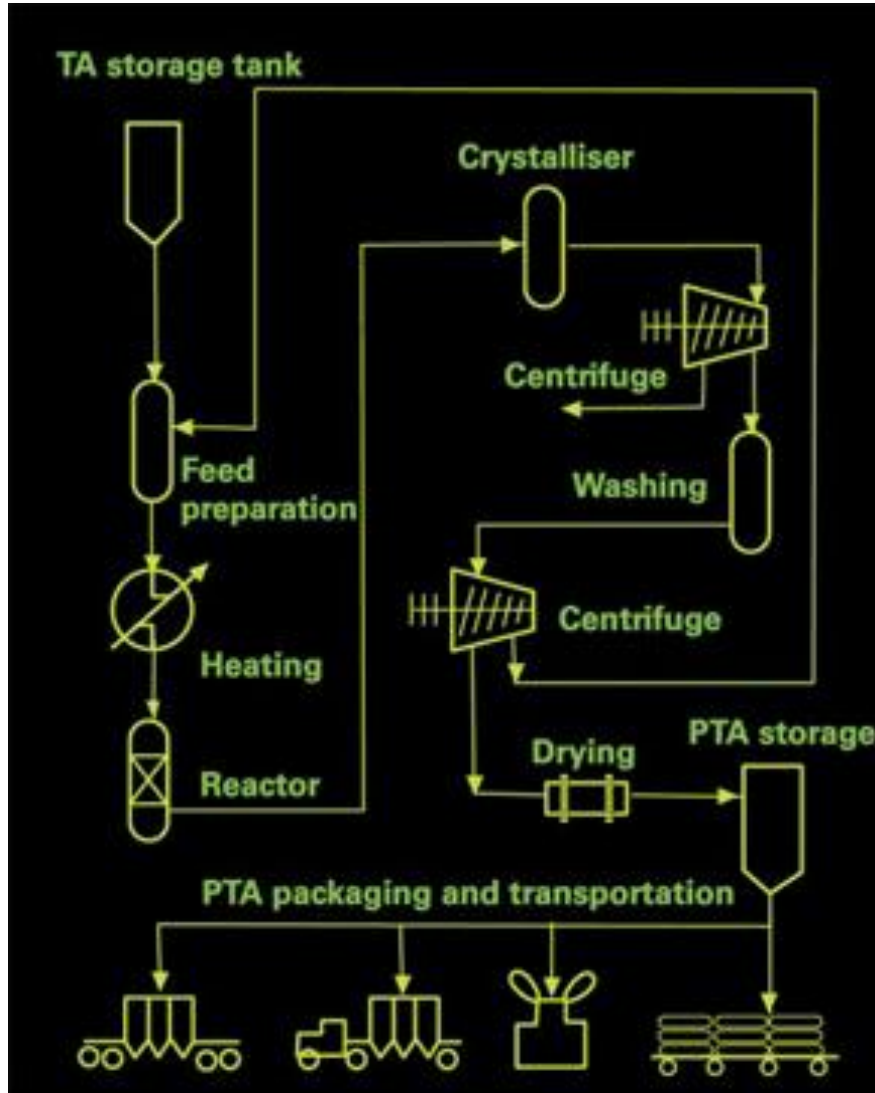
Source is placed in the vessel wall
vessel wall is reduced
2 detectors in parallel for double sensitivity



Stage 3

From stage 1 to stage 3 the pressure is reduced : Less thick tank walls. One detector only + standard source container.

Purified Terephthalic Acid (PTA)



Step 2:

Purification

heating + washing

In a fixed bed catalyst reactor the impurities are soluted. In the centrifuge they are separated from the TA.

PTA ready for packing.

PTA - level measurement in hydro generator

Source is placed inside the vessel.
Dry well installation



source



detector

Polyester - Finisher

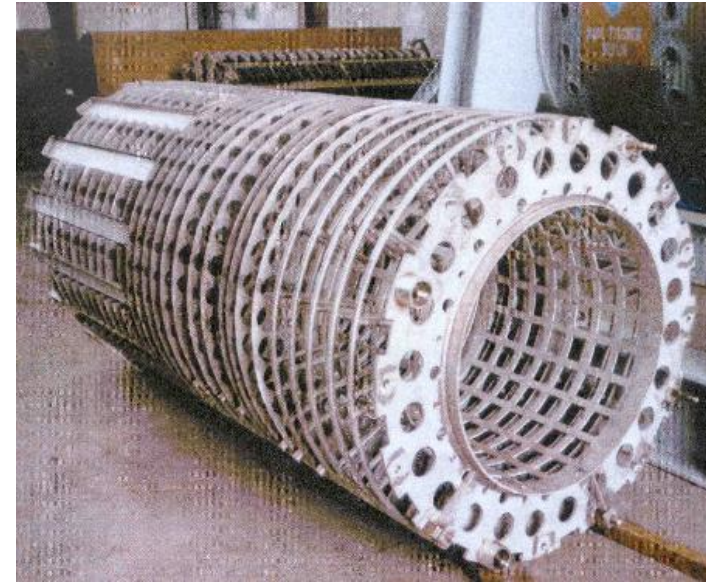
Application

Level measurement in the finisher at the inlet as well as in the outlet.

Level at the inlet and outlet are related to the viscosity of the product.

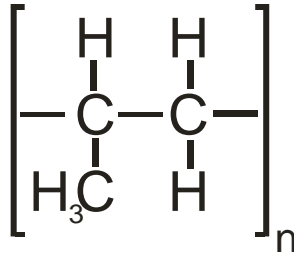
Advantages

- Non invasive
- Installations have no influence
- Free of maintenance



Polypropylene – Spheripol Process (Basell)

Processes

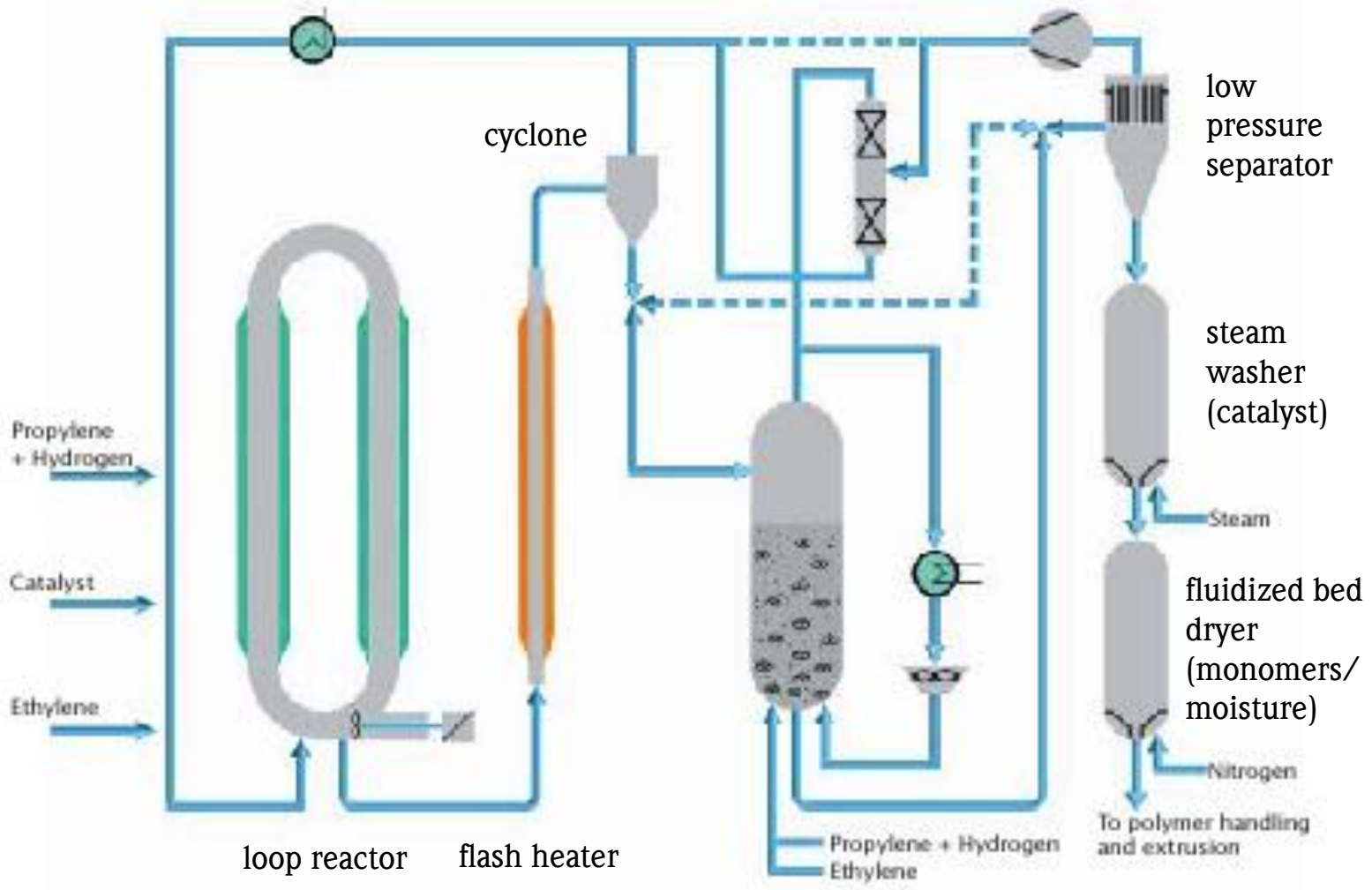


- Spheripol Process (Himont, today Shell)
- Unipol Process (Union Carbide)
- Novolen Process (BASF)

PP has many applications: from nappies and carpets, artificial grass and ships' ropes to car components and surgical garments.

Broadly speaking, applications can be divided in to three groups: **fine fibres, film and moulding applications.**

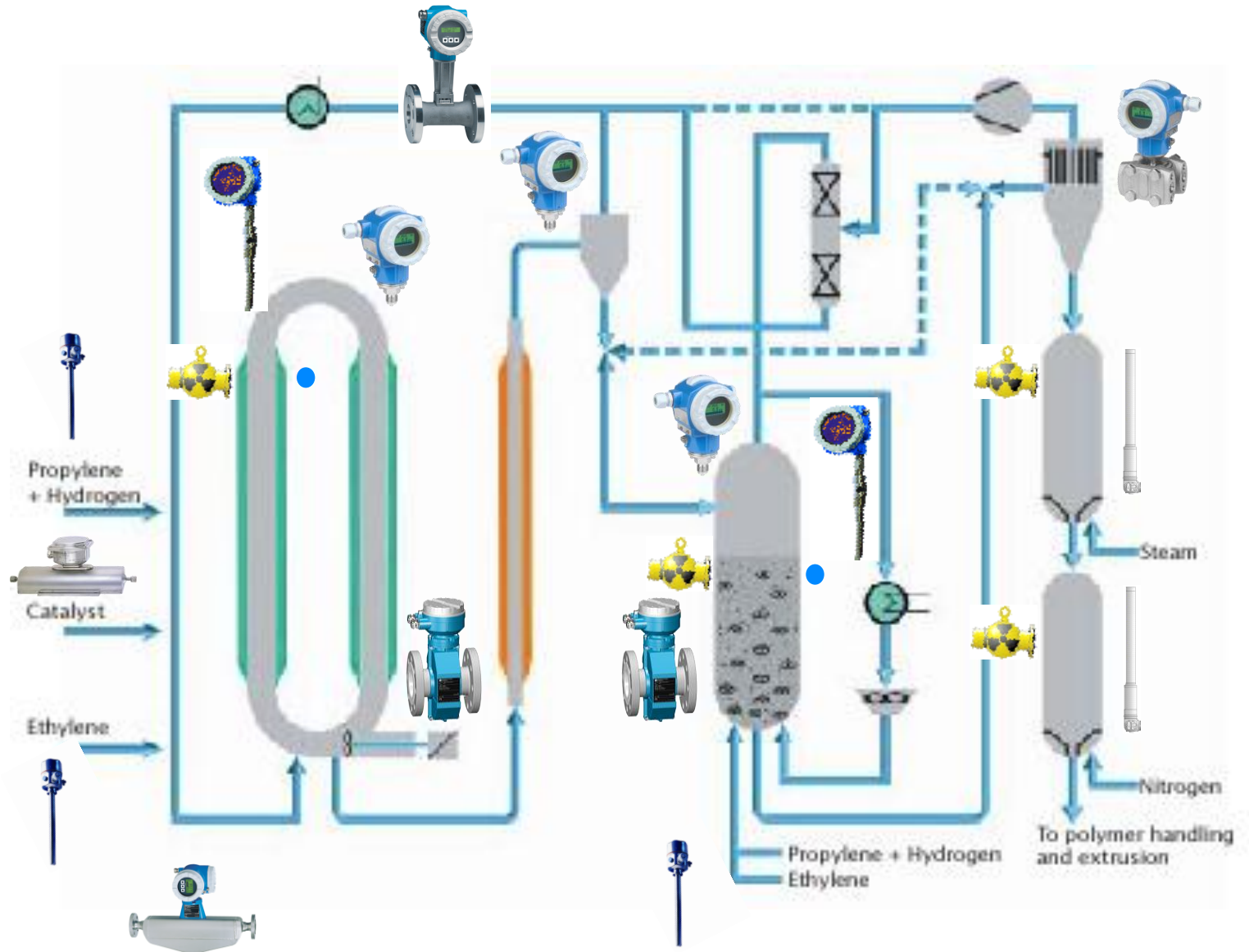
Polypropylene – Spheripol Process (Basell)



Pressure: 35 bar
Temperature: 70°C

gas phase
fluidized bed
reactor

Polypropylene – Spheripol Process (Basell)



Polypropylene - Unipol Process

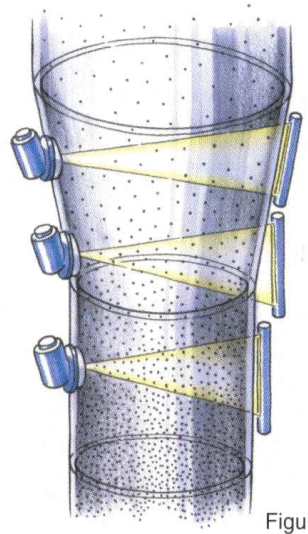


Figure A

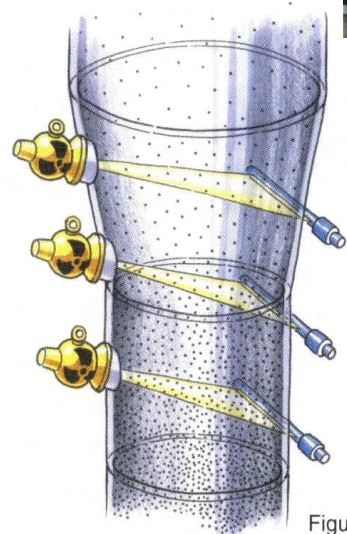


Figure B

