Fundación Ciudad de la Energía CIUDEN

Oxyfuel Combustion Conference 3

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CIUDEN s CO_2 Transport Rig

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Organised by: ieaghg

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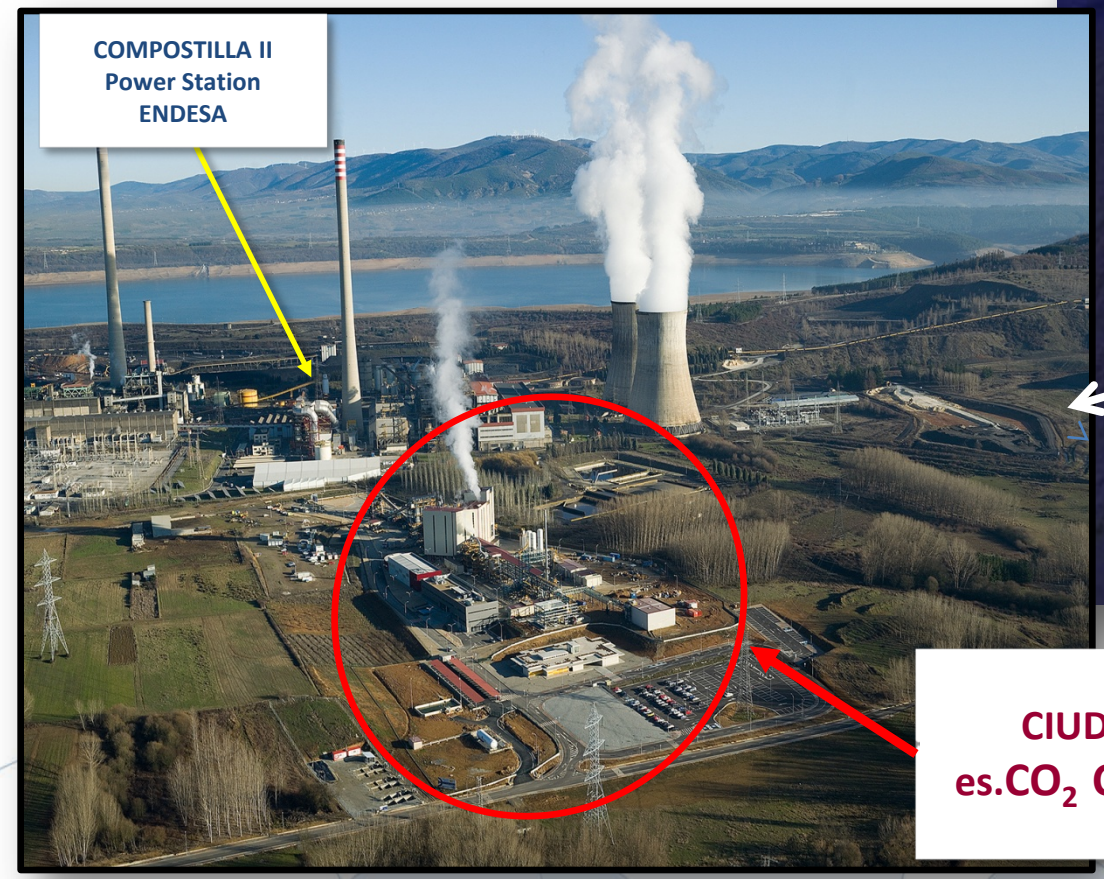
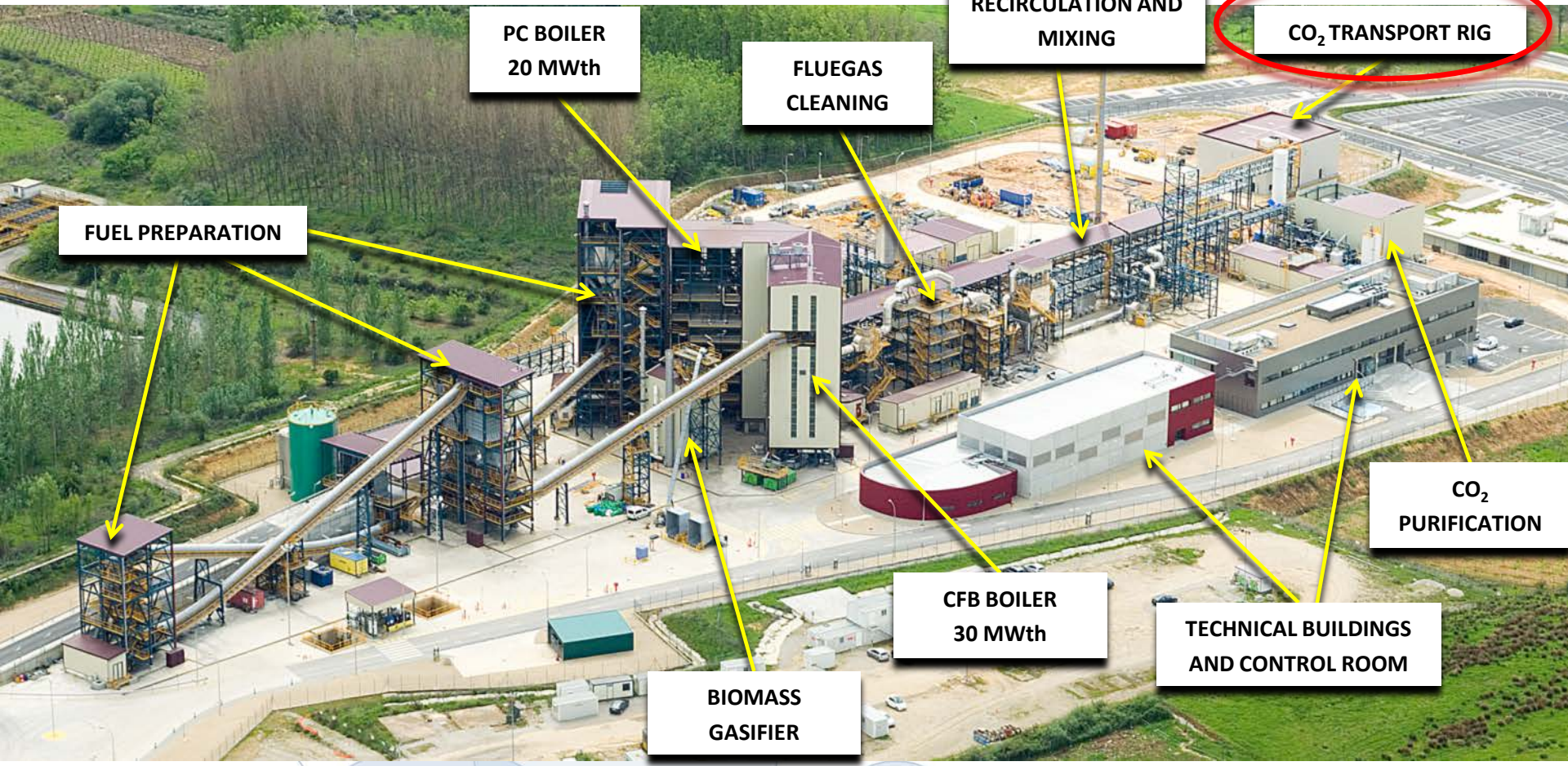
CIUDEN s Technology Development Centre for CO_2 Capture and Transport

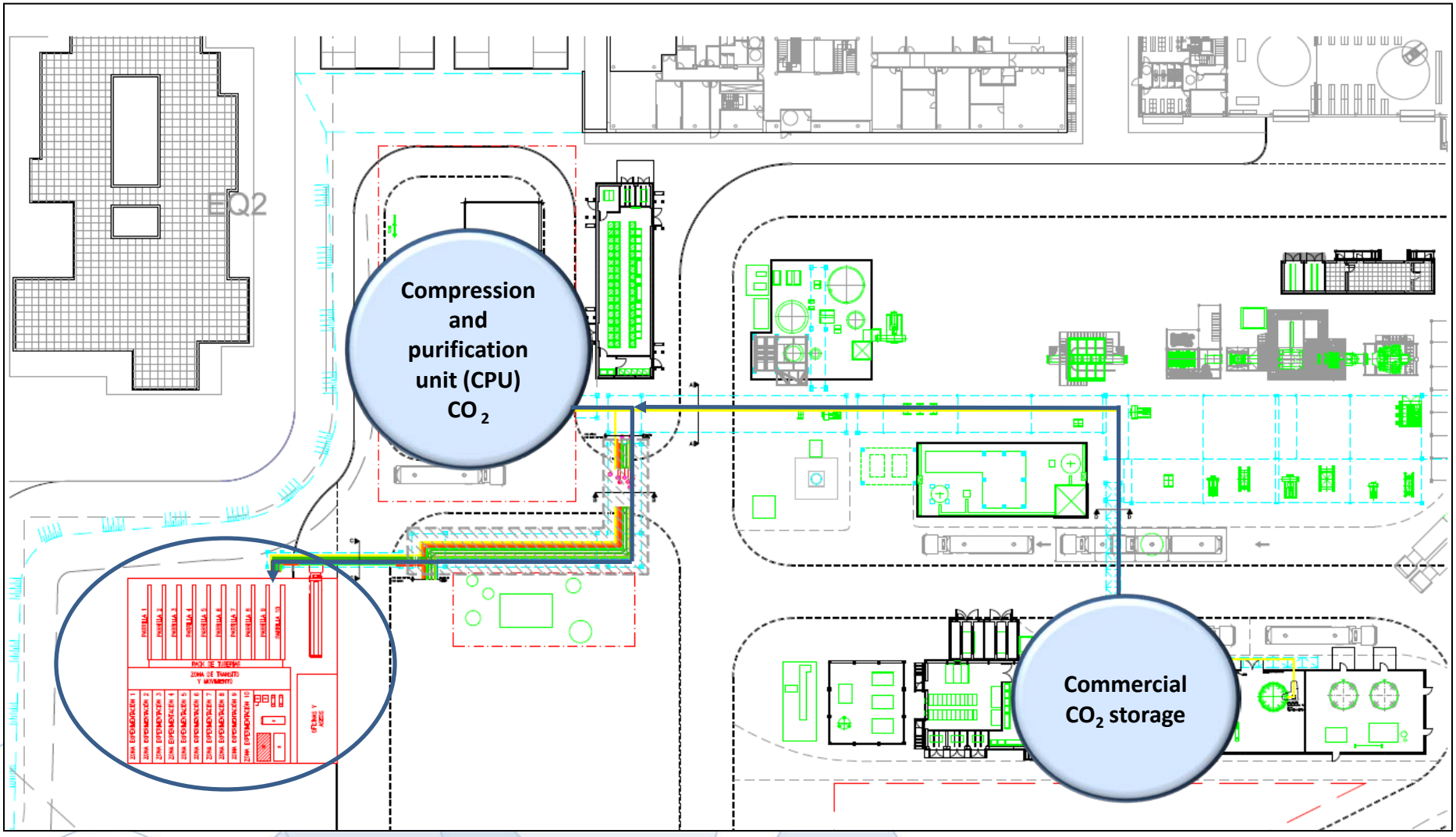


CIUDEN
es.CO_2 Centre

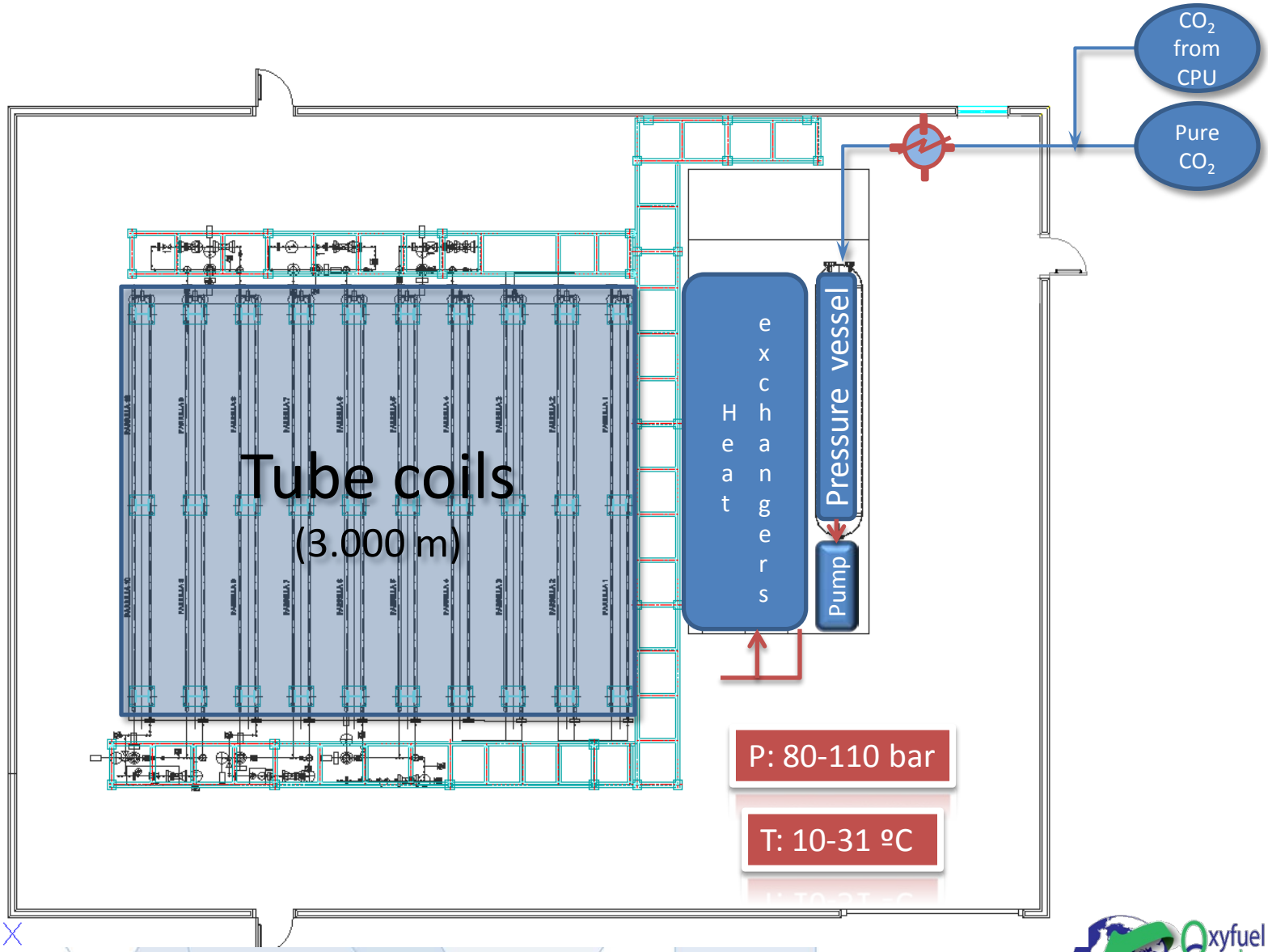
es.CO_2 - aerial view



Transport test rig - CO_2 sources (commercial and captured)



Transport test rig



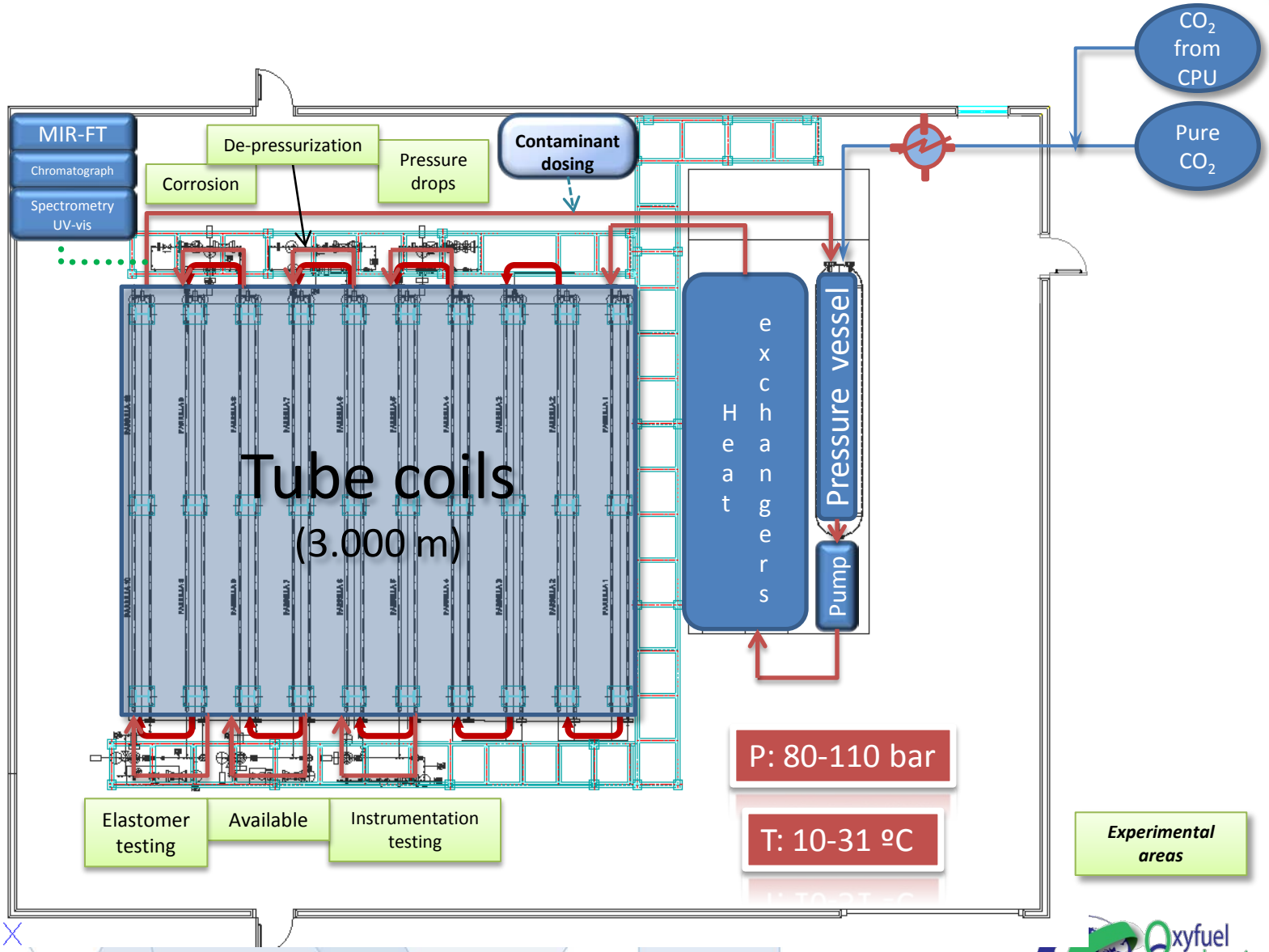
Transport test rig - Tube coil description

TUBE COI

TUBE COI

TUBE COI

Transport test rig



Transported CO_2 composition – Dosing capabilities

New components from CO_2 capture processes

Compound	Concentration limit
H_2S	200 ppm
CO	2000 ppm
SOx	100 ppm
NOx	100 ppm
H_2O	500 ppm
O_2	Aquifer <4 vol% (all non cond. gases), EOR >100 ppm
CH_4	Aquifer < 4 vol%, EOR <2 vol% (all non cond. gases)
N_2 , Ar, H_2	<4 vol% (all non cond. gases)
CO_2	> 95%

SOURCE: ECOFYS STUDY

Transport test rig - Design parameters

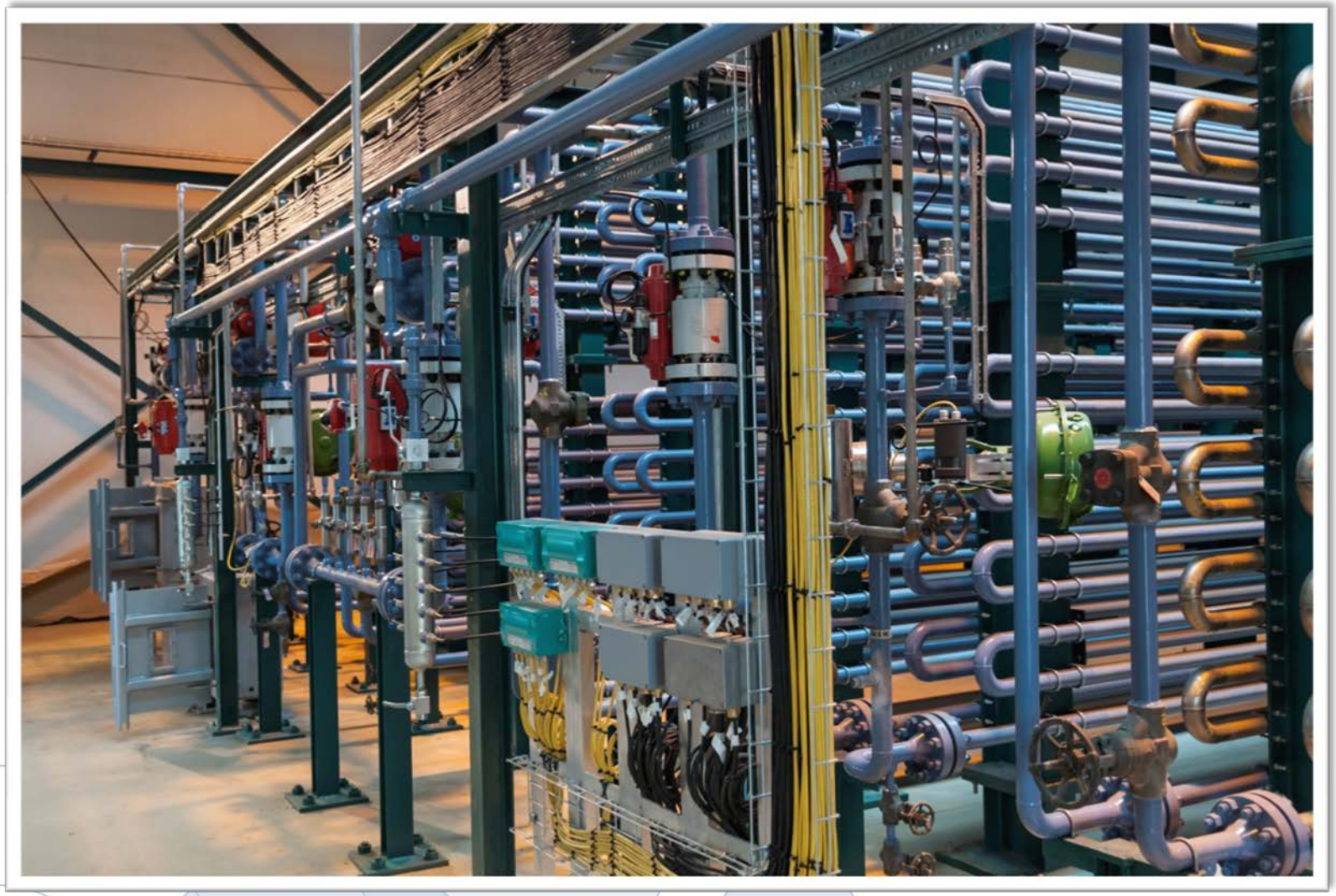
Operating P (barg)	80 - 110
Operating T (ºC)	10 - 31
Pipeline size (inch)	2
Total pipeline length (m)	3,000
Recirculation Pump (m^3/h)	15
High Pressure Vessel (m^3)	4.5
Pressure Drop (bar)	30
Building (m^3)	23x18x8.5
Pipe material	CS (2 SS tube coils)

Transport test rig - Experimental areas

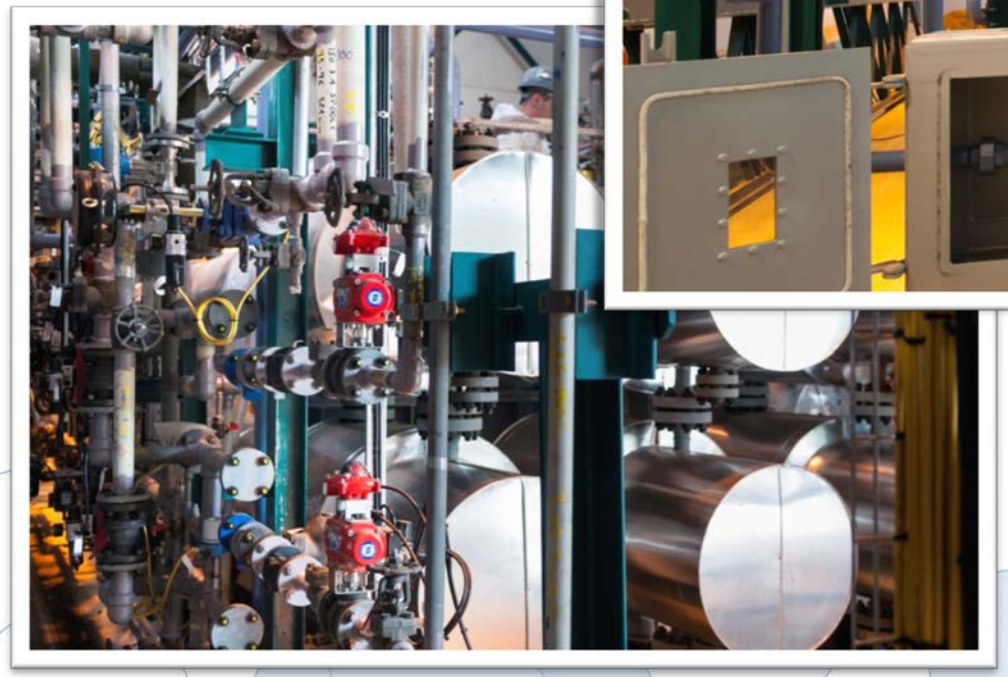
- Pressure drops
- Instrumentation testing
- De-pressurization
- Corrosion and material testing
- Leaks
- Available one

The tests can be carried out with different CO_2 qualities and at different P & T

Transport test rig pictures (I)

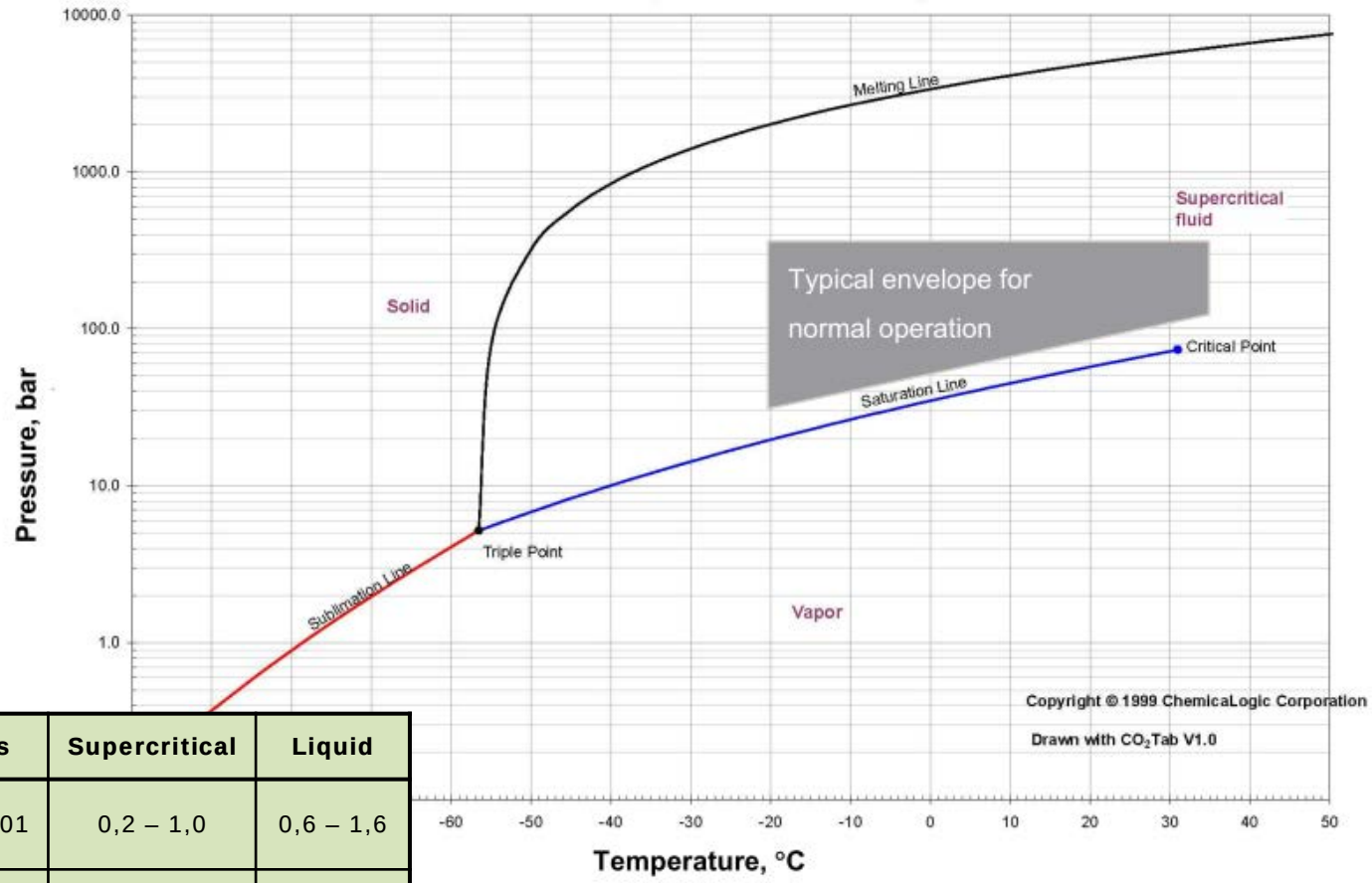


Transport test rig pictures (II)



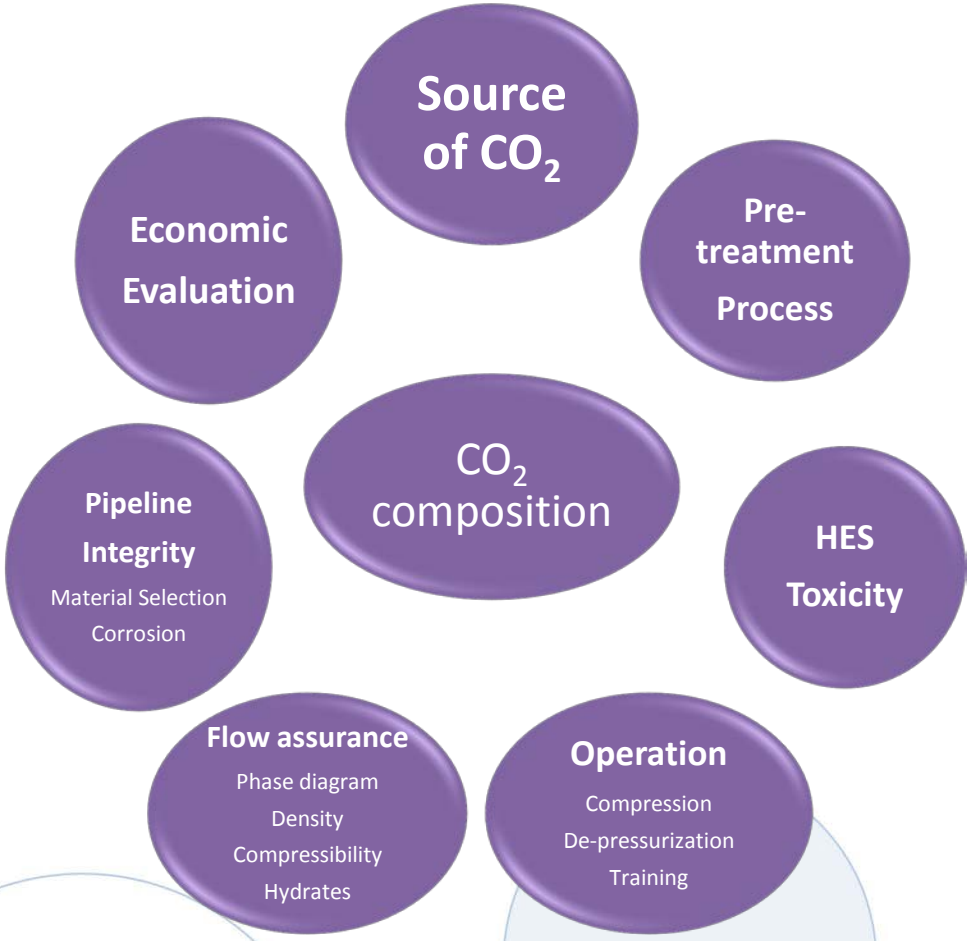
Transport test rig pictures (III)

CO_2 properties– Phase diagram



Property	Gas	Supercritical	Liquid
Density (g/cm³)	≈0,001	0,2 – 1,0	0,6 – 1,6
Diffusivity (cm²/s)	0,1	0,001	0,00001
Viscosity (g/(cm s)	0,0001	0,001	0,01

CO_2 pipeline composition



CIUDEN´S CO_2 transport test rig

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Partner (funding, collaboration agreement)

Theoretical studies	Basic research	Applied research

EEPR – OXY-CFB-300 Compostilla (III)

Experimentation capabilities in Transport TDP (WP2): Impurities (composition), corrosion - material testing, different P&T, pressure drops, instrumentation testing and de-pressurization

TEST MATRIX SUMMARY - CO2 TRANSPORT TDP

Dec. 2012

Test/ Week	W1	W2	W3
1	T1		
2		S1	S2

Operation Range

P: 60 to 100 bar

T : 12 to 27 ºC

Fluid: dense phase

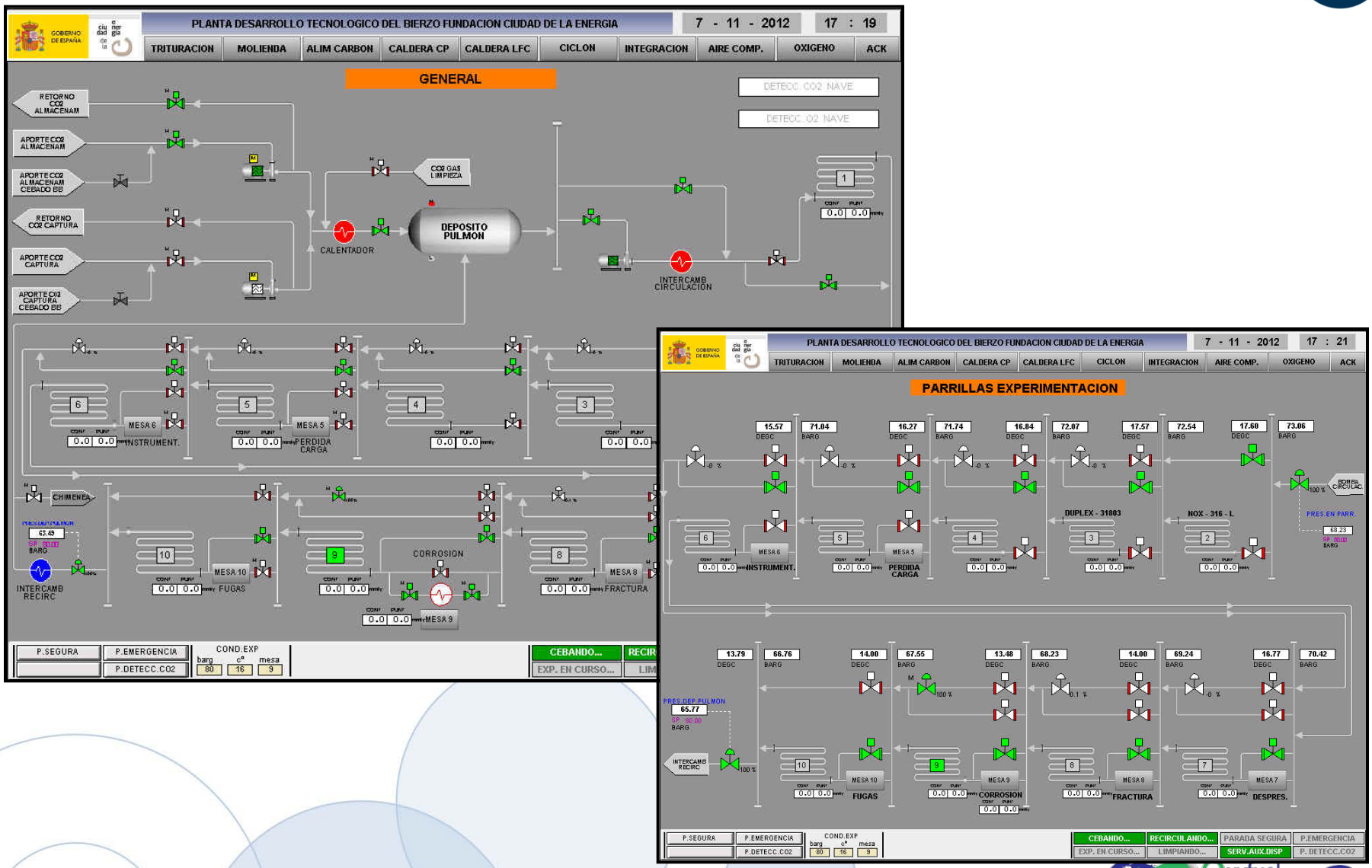
Characterization Tests

These tests have run for one week and the results obtained will give us the information and the know how on the operation of the unit and the capabilities of the instalation. Commercial CO2 has been used, with differente P and T values.

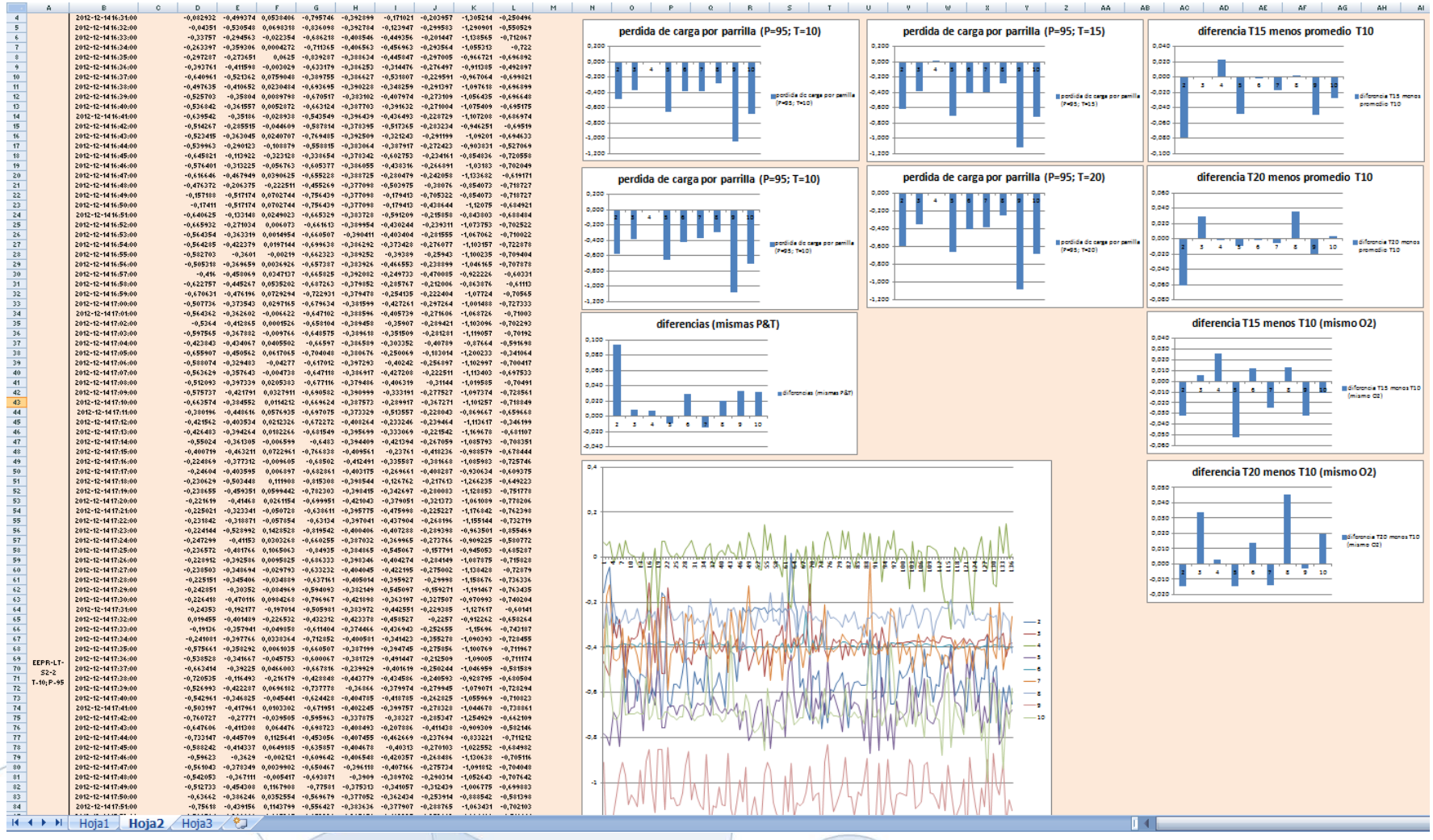
Parametric Tests

Parametric tests have consited of different tests with real CO2 from the CPU at different P and T values. On a second stage, the fluid has been dopped with different contaminants.

Operational SCADA of the Transport test rig



Transport test rig - Tests



Transport test rig - Tests

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The Compostilla Project
OXYCFB300

THANK YOU VERY MUCH FOR YOUR ATTENTION

For further information, please contact
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