RICH: VALIDATION OF NEW CH4 SUPPLIER AND RADIATOR GAS CLEANING

Triloki, Daniele D'Ago

Stefano Levorato, Livio Rinaldi, Fulvio Tessarotto

OUTLINE

> CH_4 transparency measurement

> RICH radiator gas cleaning

CH4 TRANSPARENCY MEASUREMENT

PURPOSE OF THE MEASUREMENT

Purpose: compare the transparency to UV light of two "different" CH4 provided by two companies (PANGAS and ALPHAGAZ).

CERN changed CH4 provider, we need to validate the purity of the "new" gas (PANGAS)

> measurement of transparency with RICH monochromator

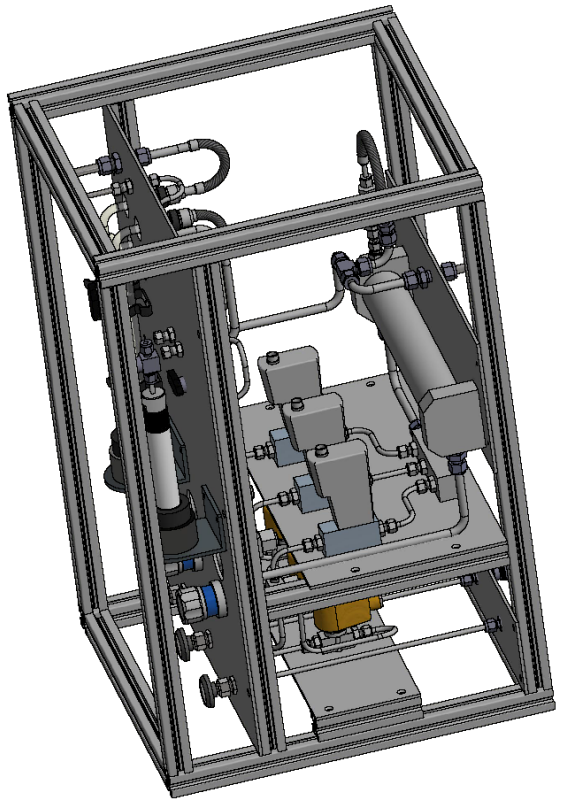
> non-explosive mixture (CH4 at 3%, N2 97%)

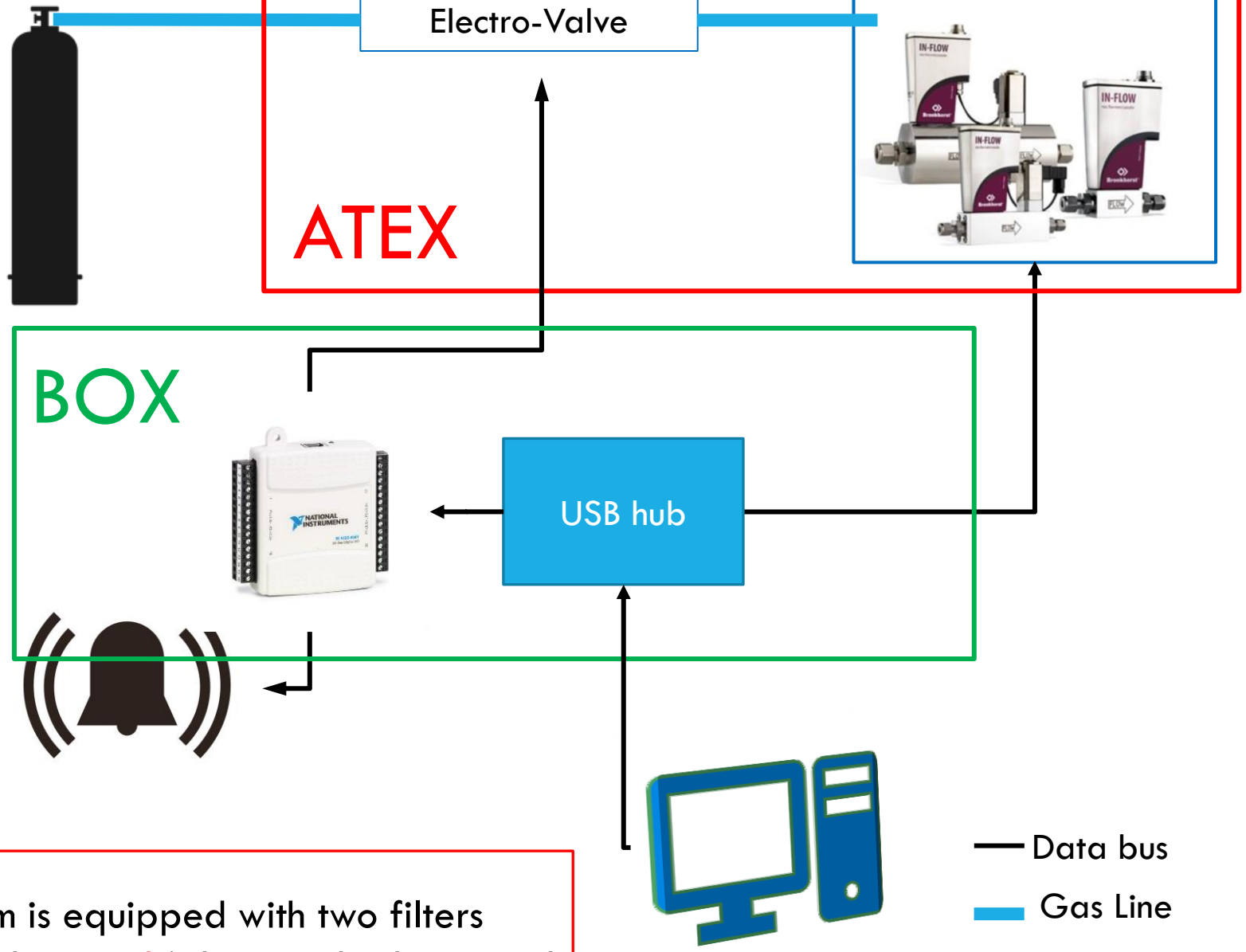
0.03 x 190 cm = 5.7 cm
~ dimension of PDs

The new, atex compliant, gas mixing system

GAS MIXING SYSTEM

Designed on purpose
Atex compliant
Remote operation





The system is equipped with two filters (hydrosorb and oxysorb) that can be bypassed

THE MEASUREMENT

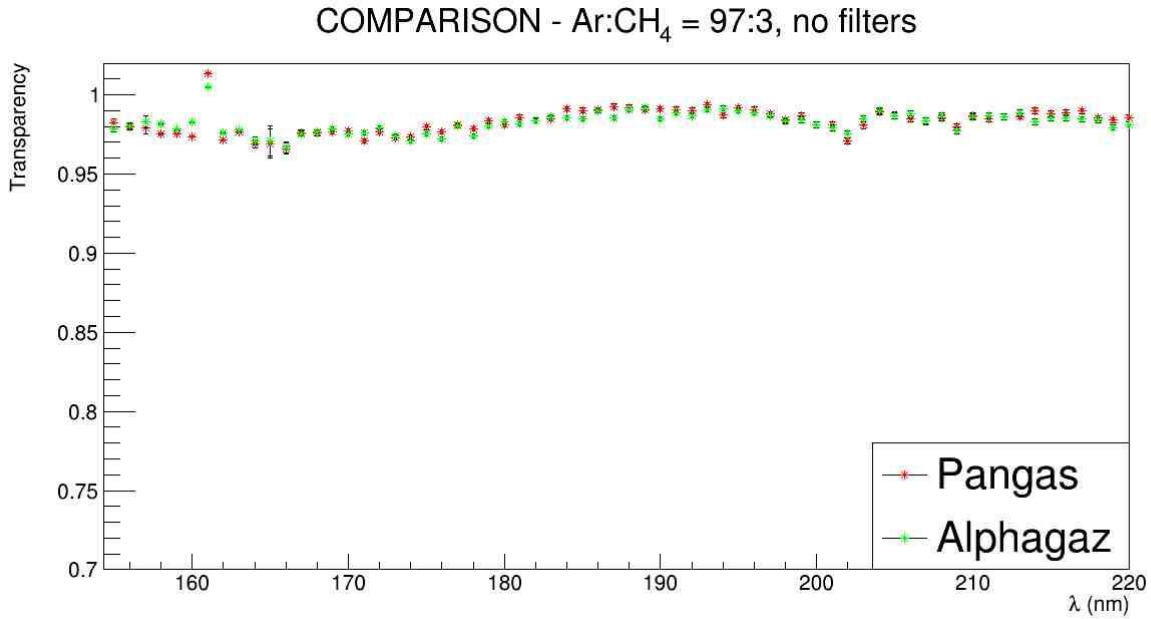
PROCEDURE: Gas is mixed in ATEX mixing system and monochromator is filled with non explosive mixture (filtered).

Once several volumes are flushed (>6) Transparency is measured

Repeat with filters bypassed

LIST OF MEASUREMENTS
in chronological order

> PANGAS filtered
> PANGAS non filtered
> ALPHAGAZ filtered
> ALPHAGAZ non filtered

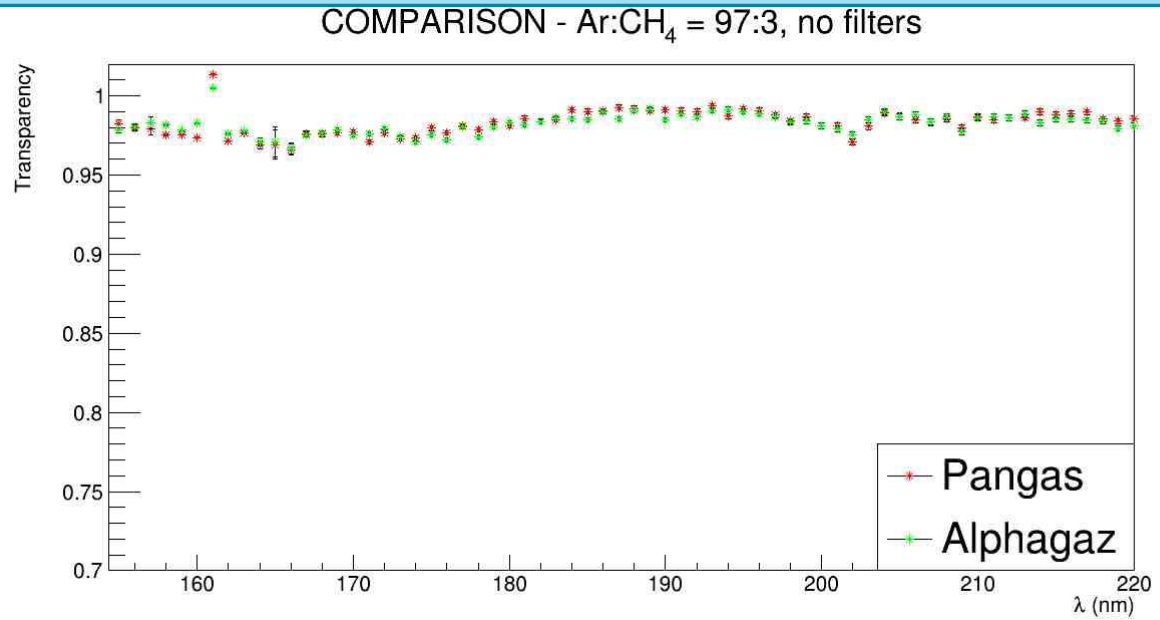


THE MEASUREMENT

LIST OF MEASUREMENTS
in chronological order

PANGAS CH4 transparency in UV region is higher than 97% in the considered wavelength range.

VALIDATED



RICH RADIATOR GAS CLEANING

RICH GAS CLEANING

Purpose: filter C_4F_{10} from impurities until it becomes transparent to UV (155nm - 220 nm)

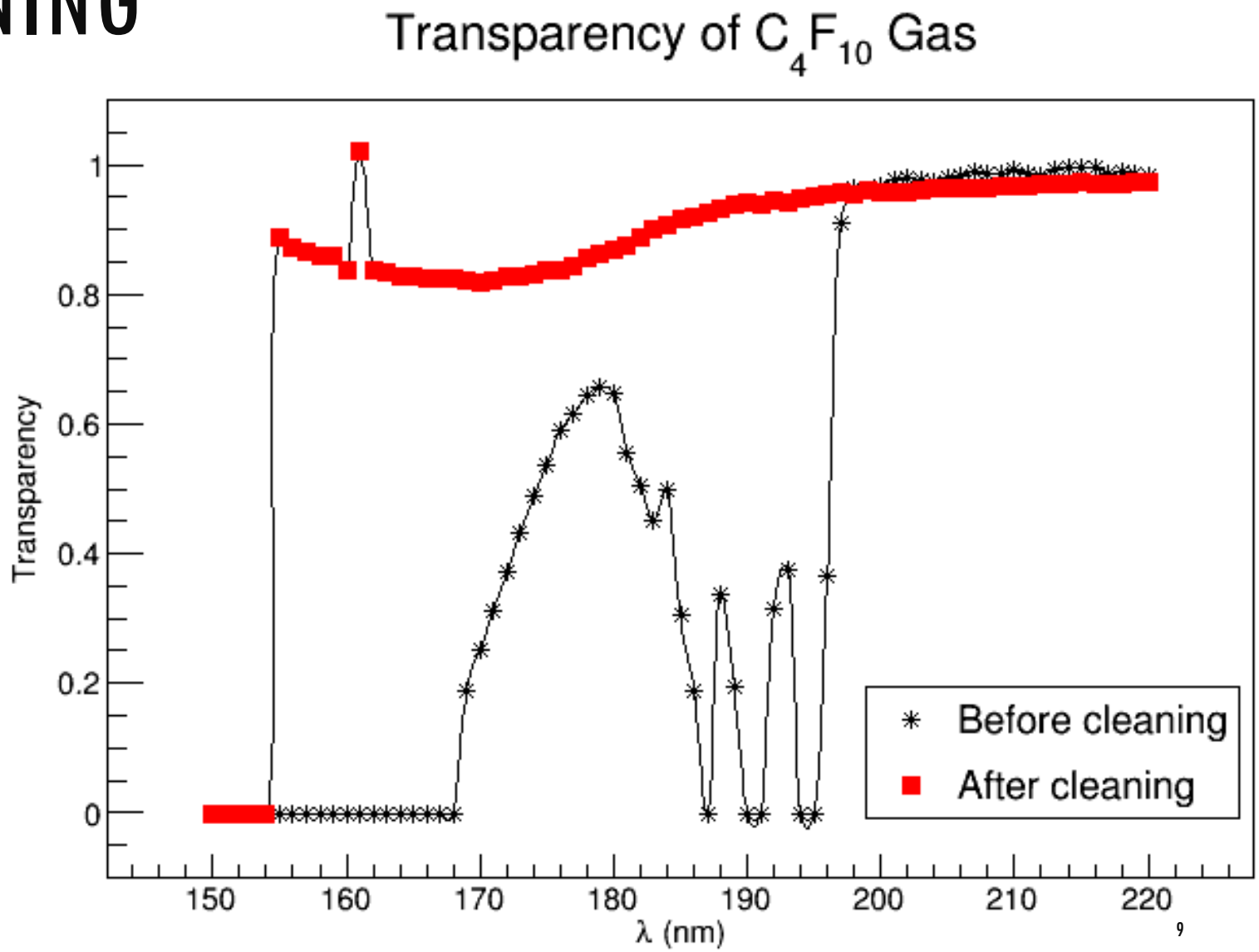
Main contaminants are:

Hydrocarbons > activated C

H_2O vapour > molecular sieve 3A

O_2 > activated Cu

Transparency is measured with RICH monochromator (see appendix)



THE TASK

C_4F_{10} delivered in a big bottle (630 kg, 930 l)

In order to clean it all:

1) spilling into smaller bottle (65 l)

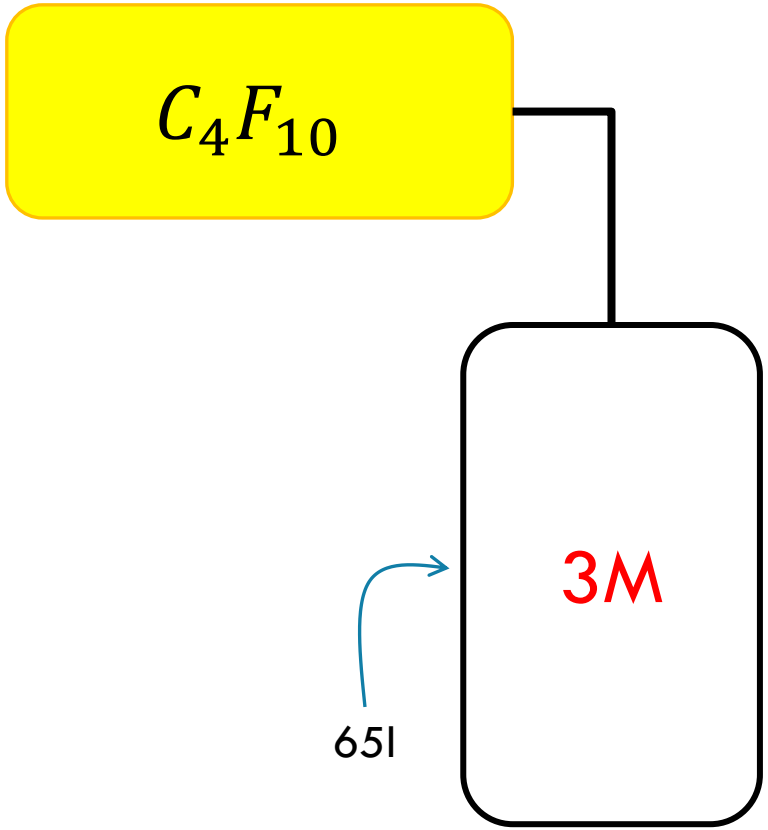
2) cleaning through “cleaning setup”

Run 2021 need ~350kg

Cleaning started in beginning of March

Step1

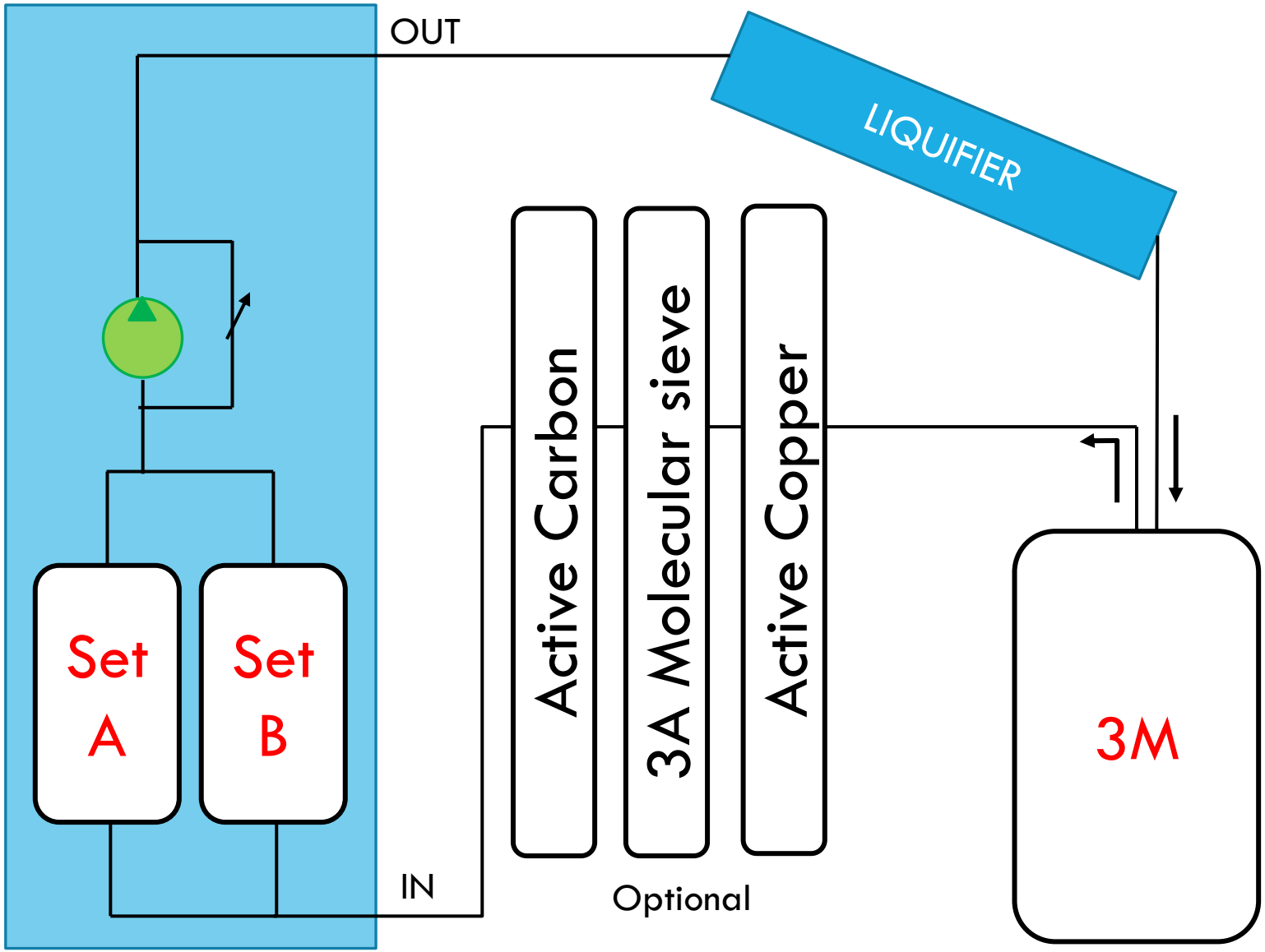
Gas transfer



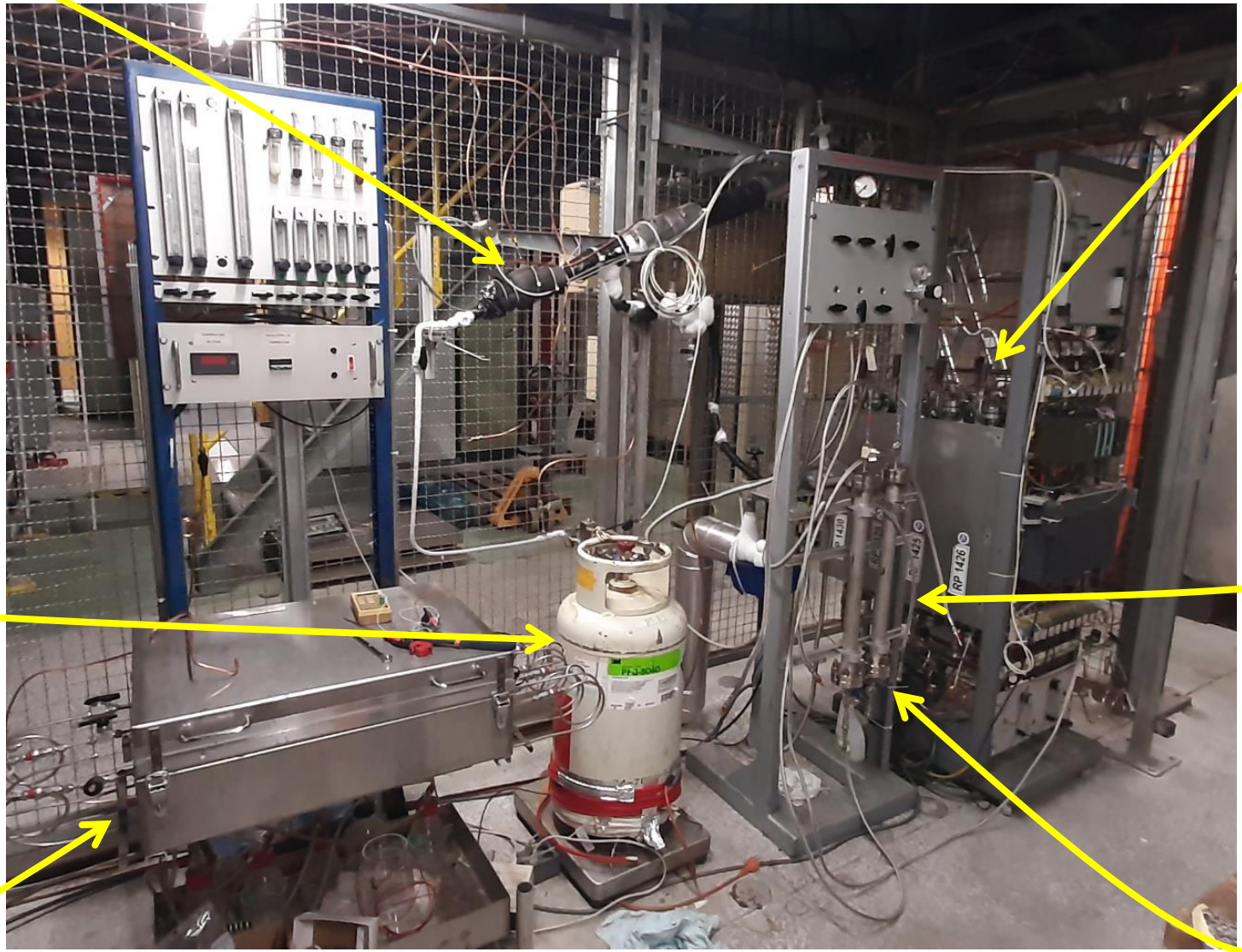
Step 2

Closed loop gas filtering

In each filter set:
1 AC + 1 3A



RICH GAS CLEANING SYSTEM



Liquifier

Filter sets (A and B)

Extra filters

Gas under cleaning

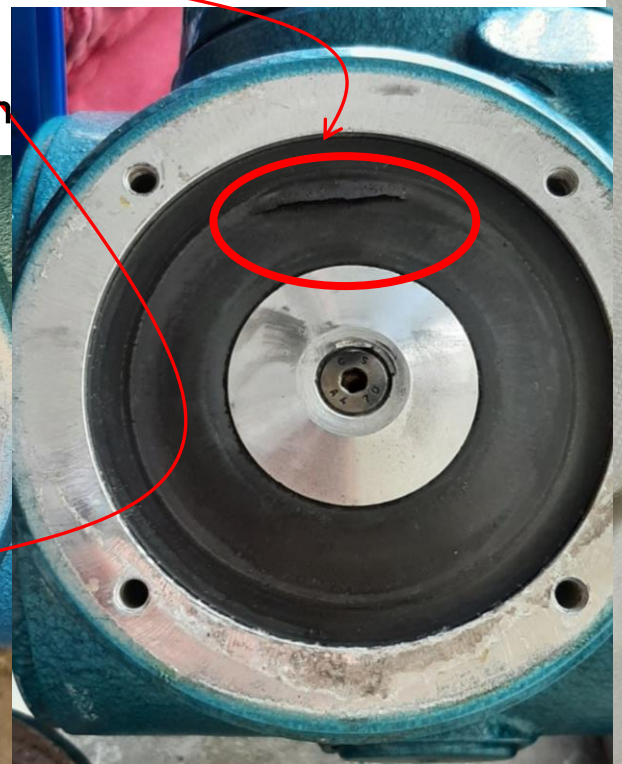
Filter regeneration station

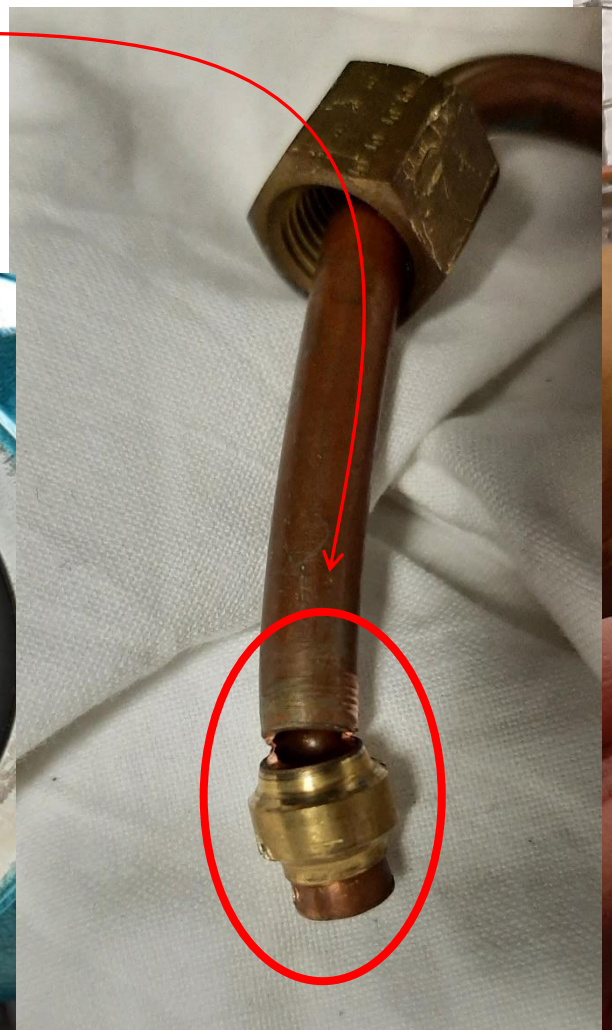
Pump

WE FACED MANY PROBLEMS…

> Few pipes were found broken in different parts of the system (pump bypass, filters) > repaired
> Pump membranes broke twice > replaced*

* At present no spares, expected to be delivered soon





SUMMARY TABLE

PROCEDURE (to reduce gas losses):
Cleaning through the same filter set (A) and change extra filters when needed.
Status after 2 months in table. Remarkable amount of work

Total Amount of C4F10 gas "processed"	Total Amount of C4F10 gas Cleaned & Transfer to Storage	Total Amount of C4F10 gas Lost during cleaning
505.86 kg	368.74 kg	137.12 kg

STILL
124.14 kg to be processed

80.3 kg in 3M bottle
43.84 kg in big bottle

Cleaning Efficiency = 72.89 %

Efficiency is lowered by huge losses in few circumstances. Hopefully we will increase cleaning efficiency

SUMMARY TABLE

Enough gas is ready for 2021 run!

PROCEDURE (to reduce gas losses):
Cleaning through the same filter set (A) and change extra filters when needed.
Status after 2 months in table. Remarkable amount of work

Total Amount of C4F10 gas "processed"	**Total Amount of C4F10 gas Cleaned & Transfer to Storage**	Total Amount of C4F10 gas Lost during cleaning
505.86 kg	**368.74 kg**	137.12 kg

STILL
124.14 kg to be processed

80.3 kg in 3M bottle
43.84 kg in big bottle

Cleaning Efficiency = 72.89 %

Efficiency is lowered by huge losses in few circumstances. Hopefully we will increase cleaning efficiency