Indoor air quality at the BnF

Partners

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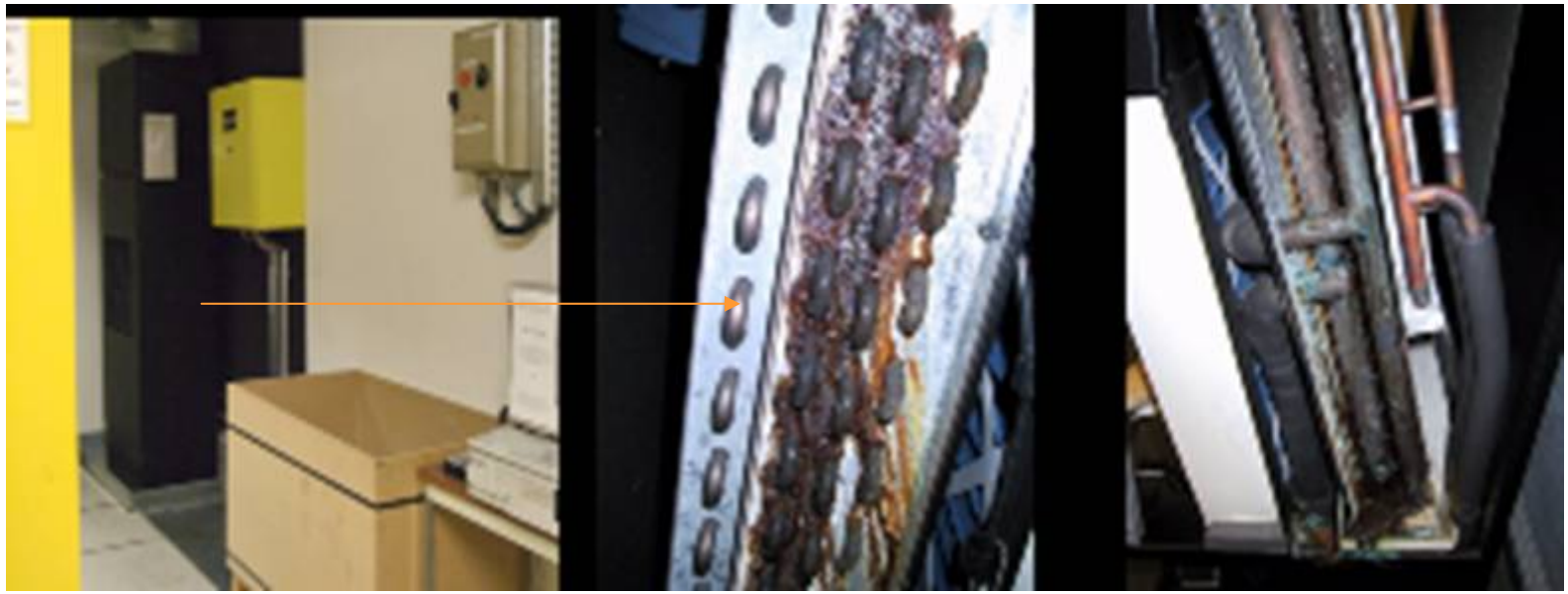
Corrosion on Hiross dehumidifiers/humidifiers



Types of corrosion

Cold pipes :

- **formicary corrosion (« ant-nest » corrosion)**

Hot pipes :

- **sulfur corrosion on copper-phosphore silver brazed joints**
- **no corrosion observed on copper – phosphore brazed joints**

Target 2005 : phase 1

Situation and state : quantification and characterization of the pollutants responsible for the corrosion :

-Corrosion monitoring of the environments

-Collecting pollutants

Sensors used

Electrical resistance (ERS)

Ag, Cu Coupons

Quartz cristal microbalance (QCM)

Passive sampling tubes

Storage rooms chosen

The choice of the storage rooms was based on :

- The intensity of the corrosion observed on the Hiross unit

- The type of collection stored

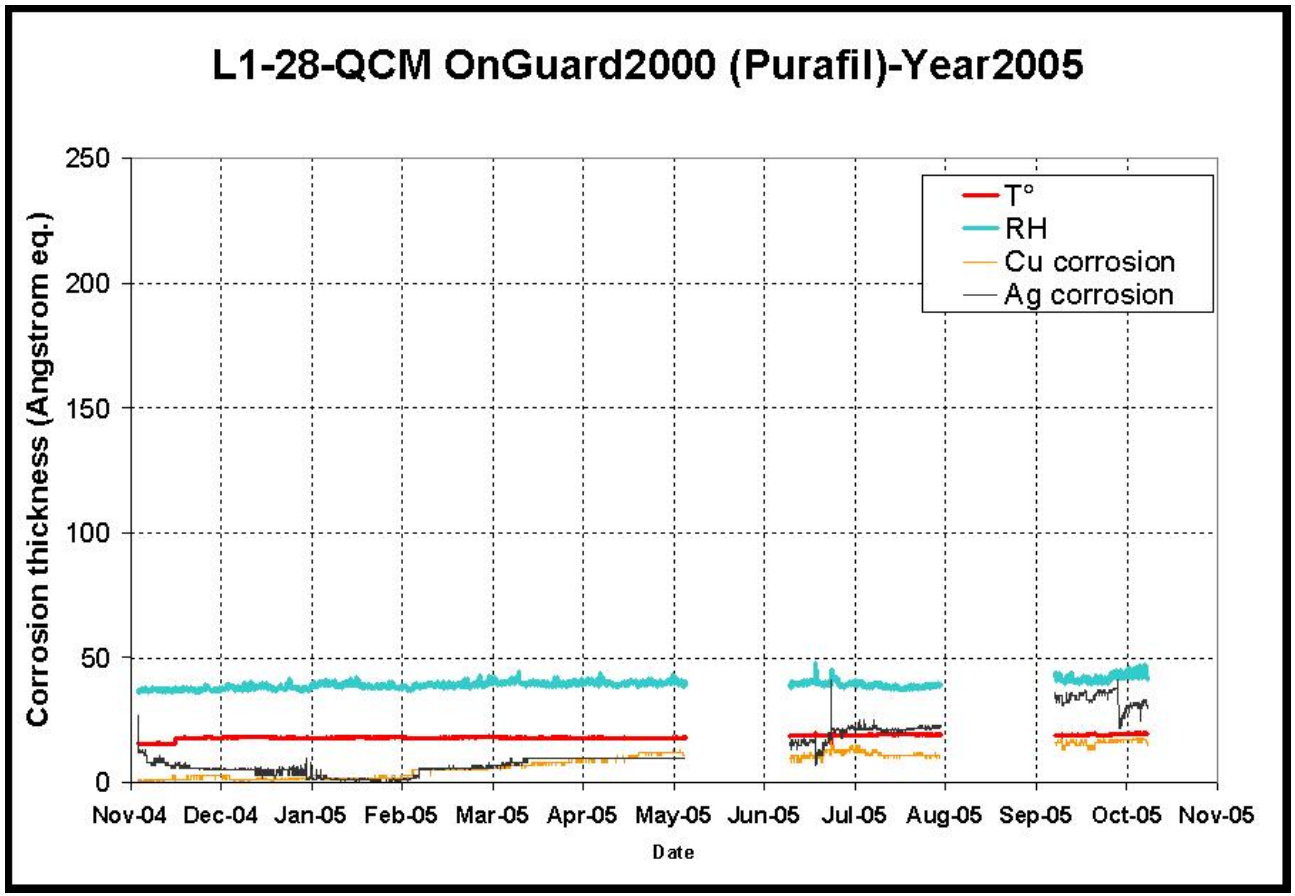
L1-28 : audiovisuel items

Corrosion levels observed on Hiross units -

Formicary : Level 0

Sulphur : Level 0

L1-28 : results obtained with QCM



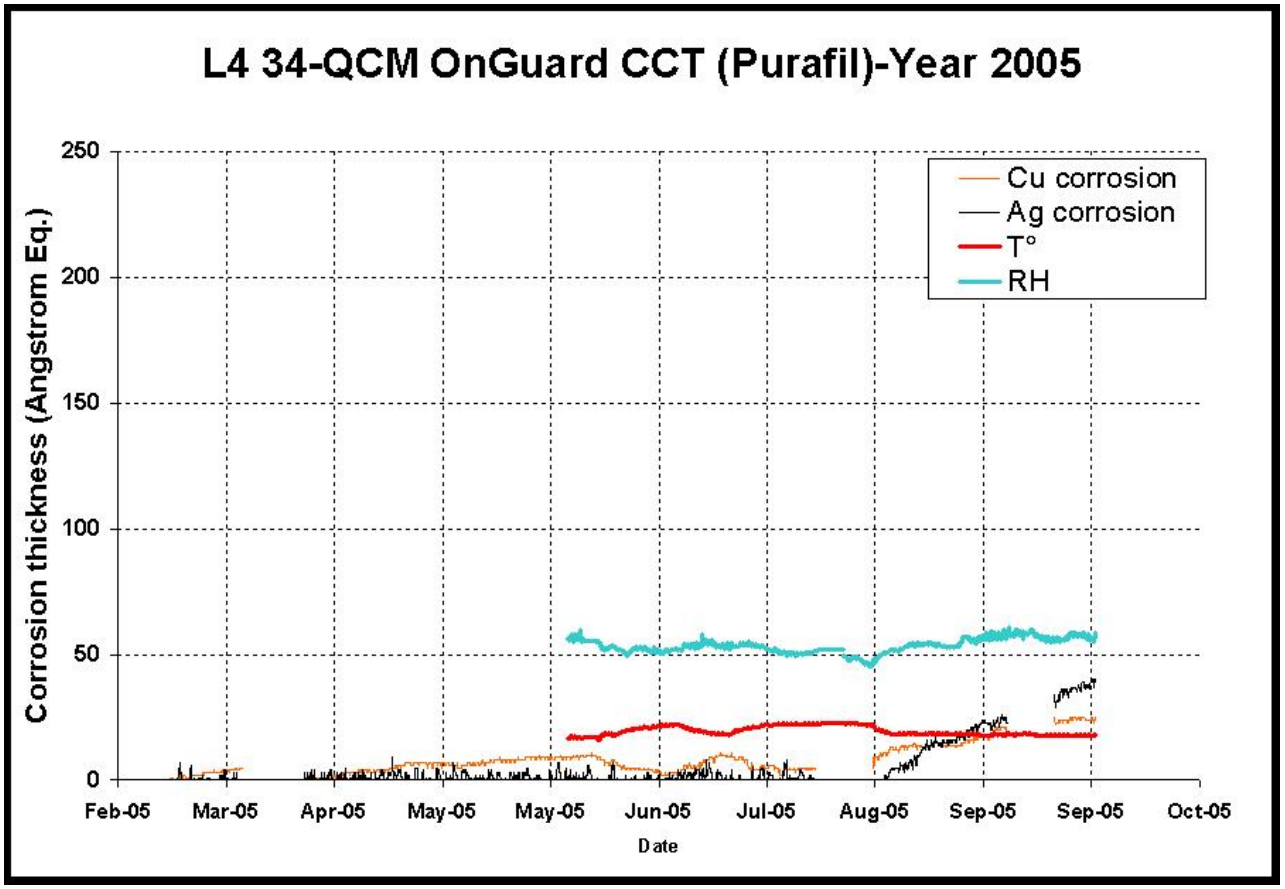
L4-34 : Books 20th c.

Corrosion levels observed on Hiross units -

Formicary : Level 3

Sulphur : Level 0

L4-34 : results obtained with QCM



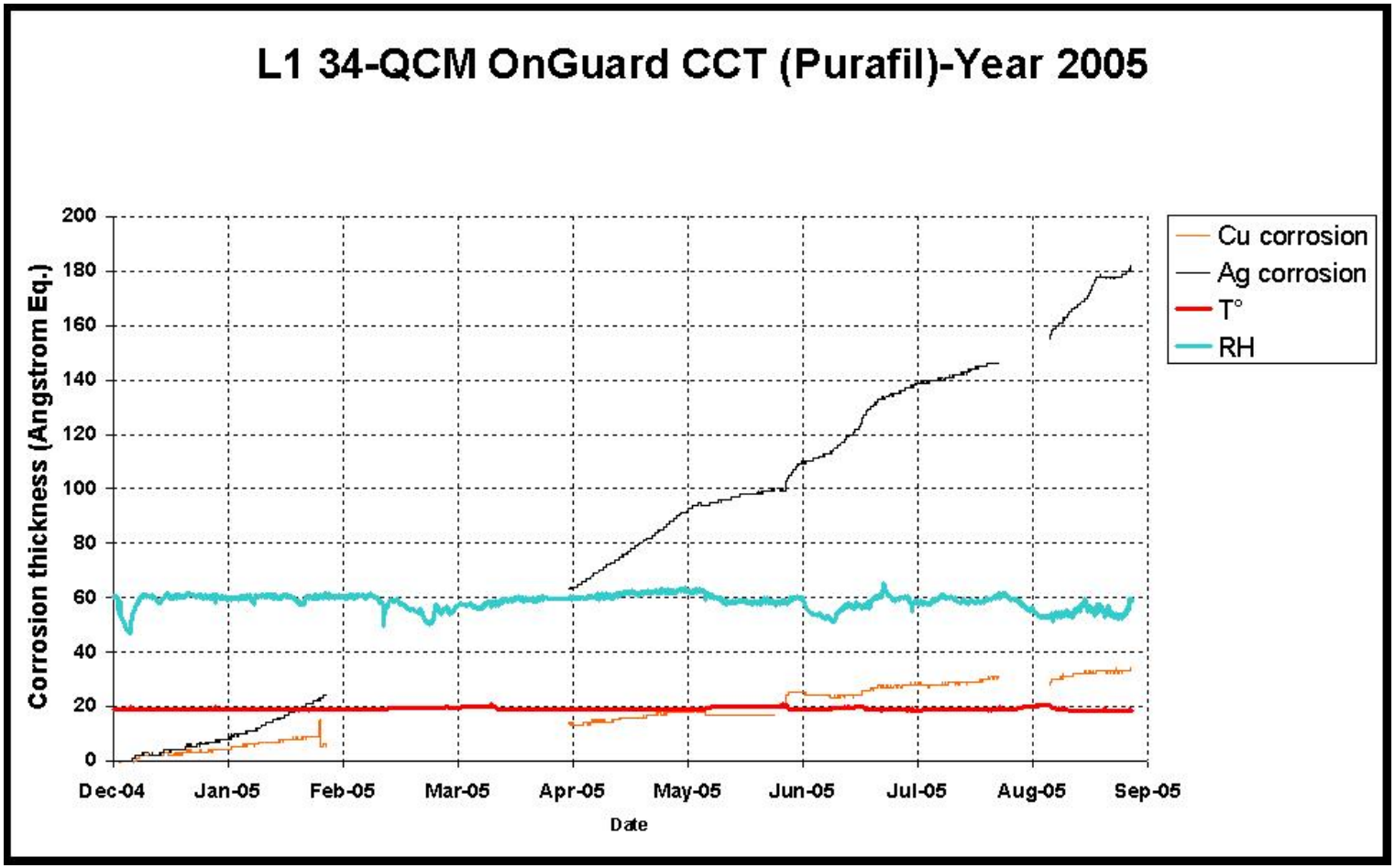
L1-34 : Newspapers in boxes

Corrosion levels observed on Hiross units -

Formicary : Level 3

Sulphur : Level 3

L1-34 : results obtained with QCM



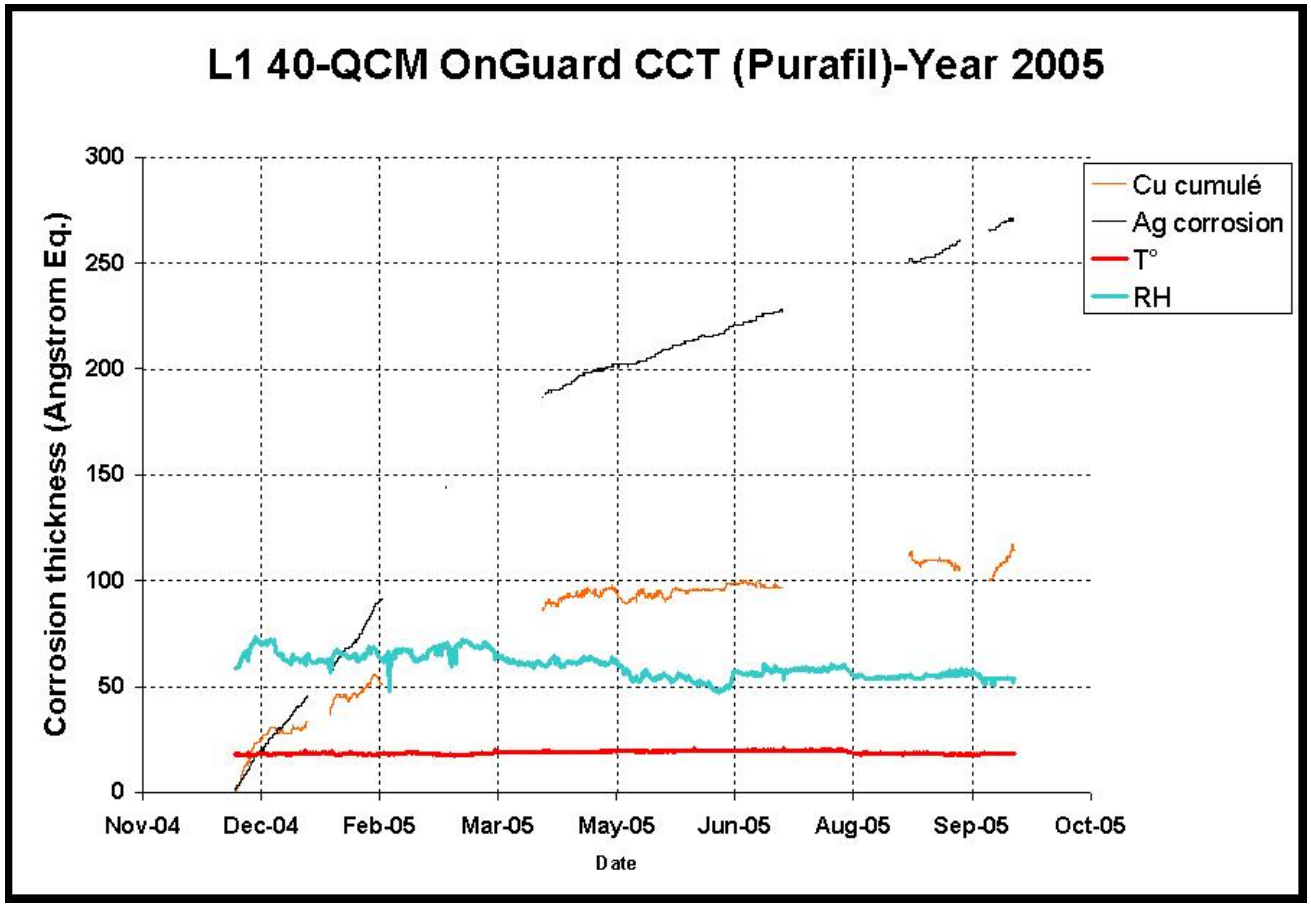
L1-40 : Magazines in boxes

Corrosion levels observed on Hiross units -

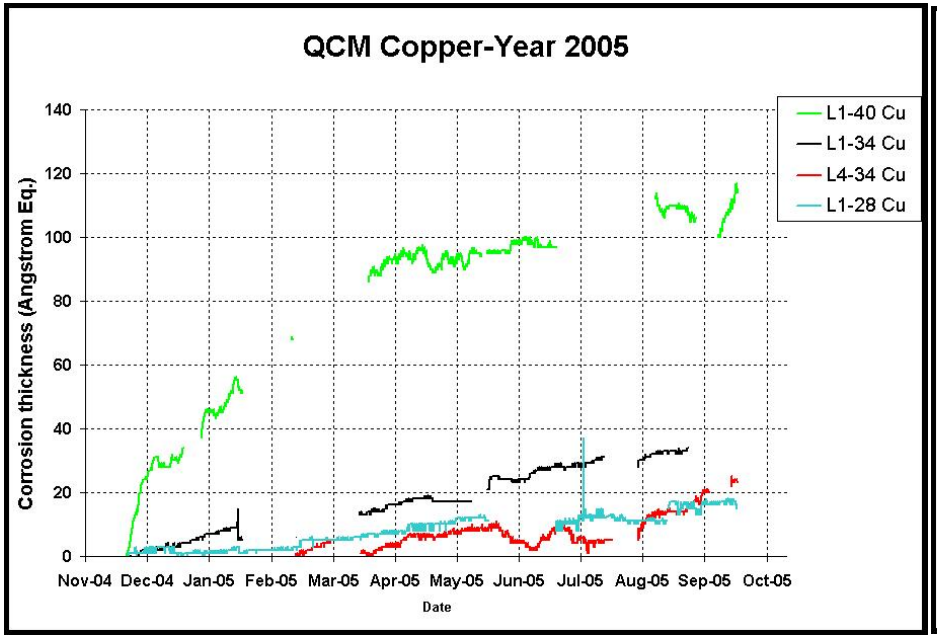
Formicary : Level 2

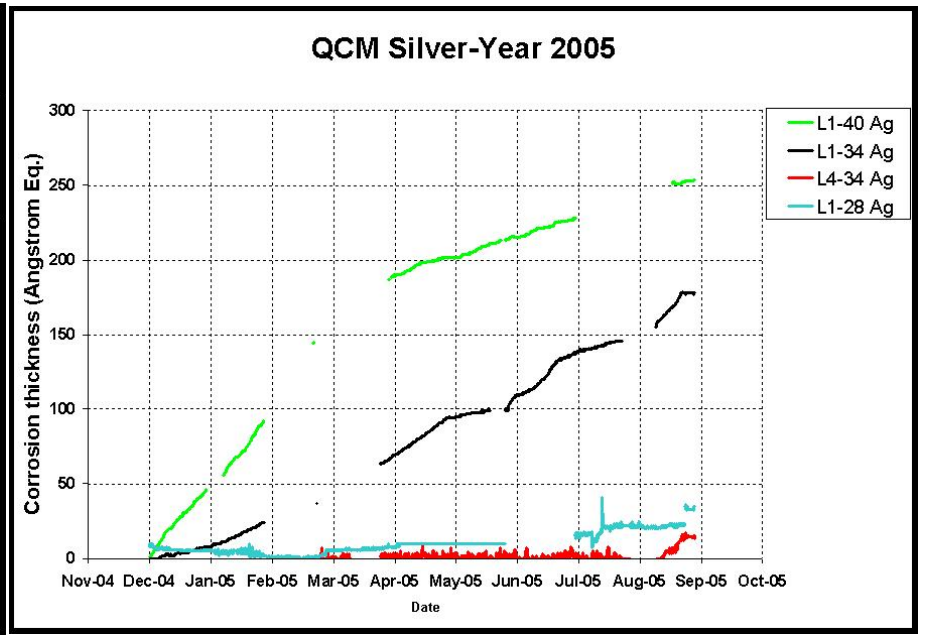
Sulphur : Level 3

L1-40 : results obtained with QCM

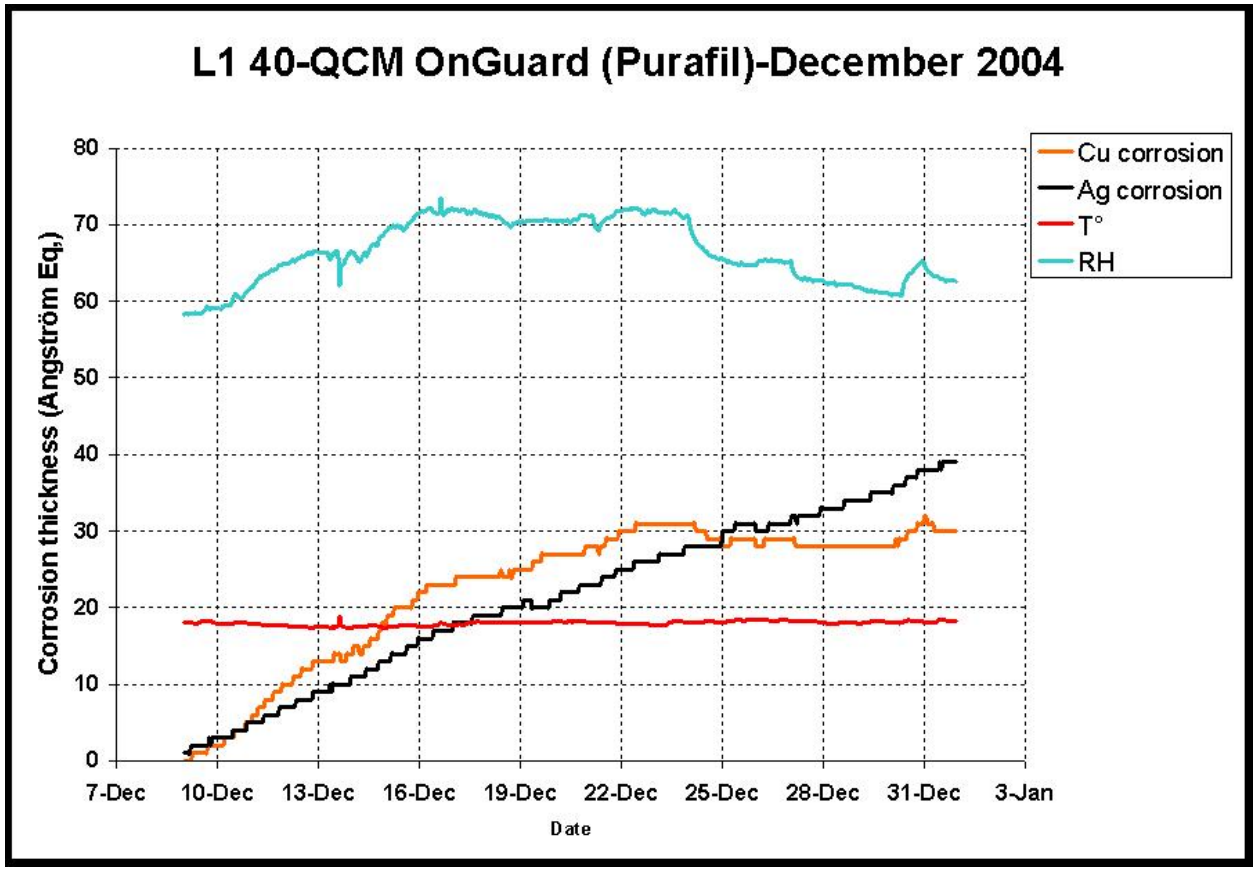


QCM results compiling



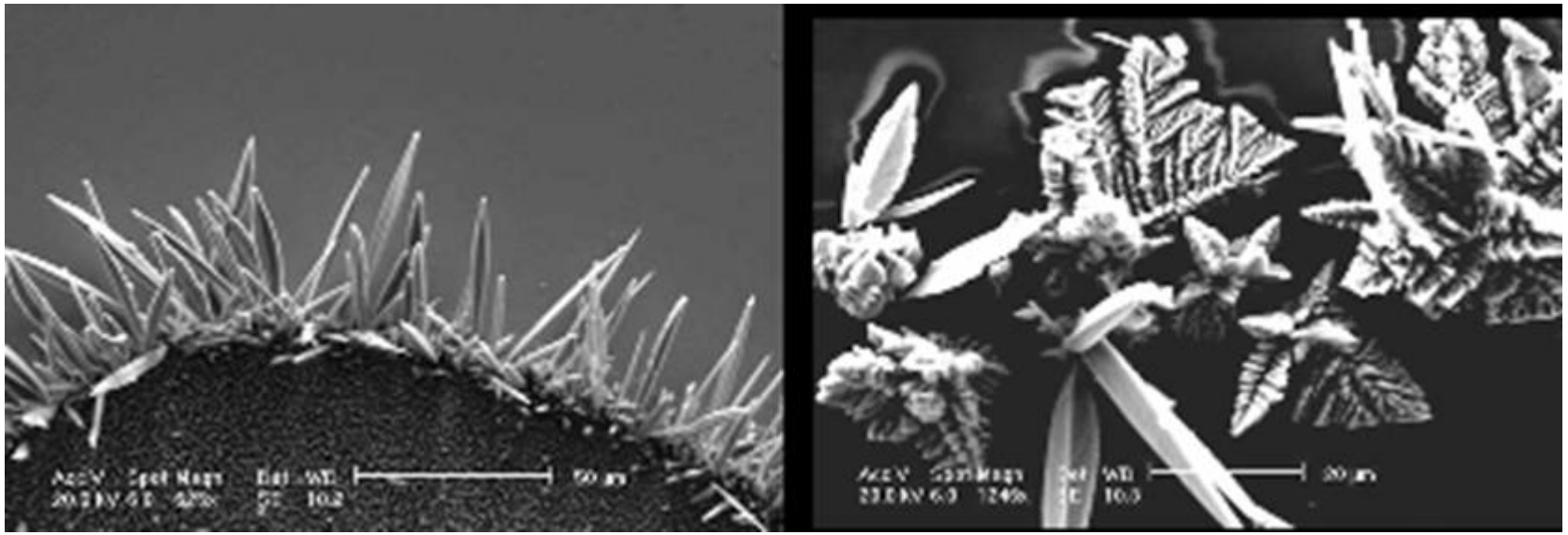


QCM results, influence of RH



- Cu sensitive to RH variations
- Ag less sensitive to RH variations

Ag corrosion – SEM EDS analysis



Ag_2S cristals

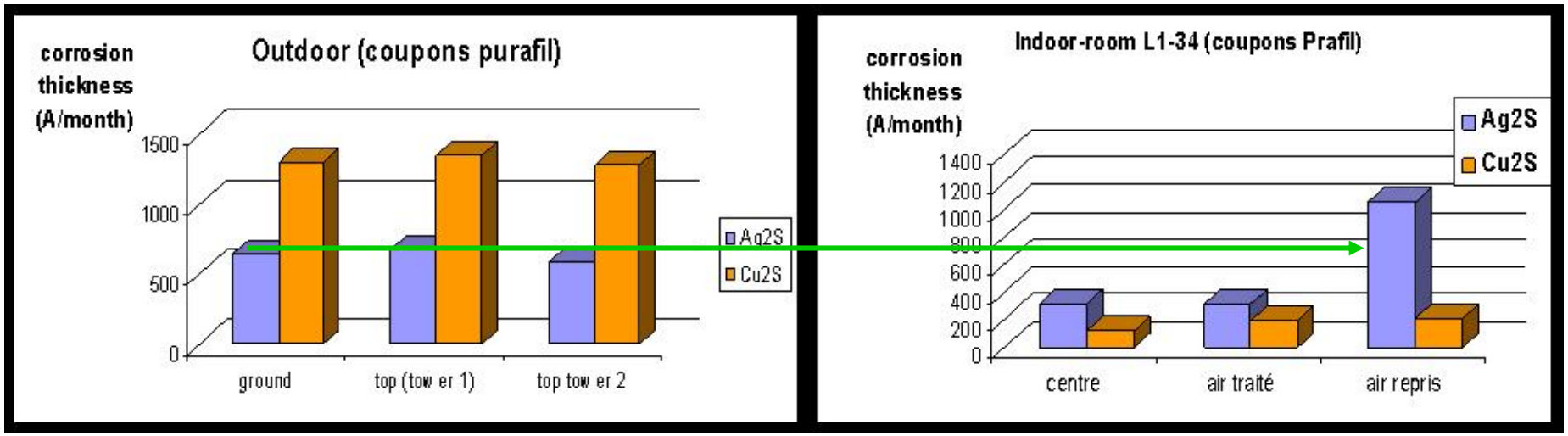
Conclusion 1

Obvious indoor pollutants emitted by the collections and conditionning boxes :

-Sulphur pollution = boxes ?

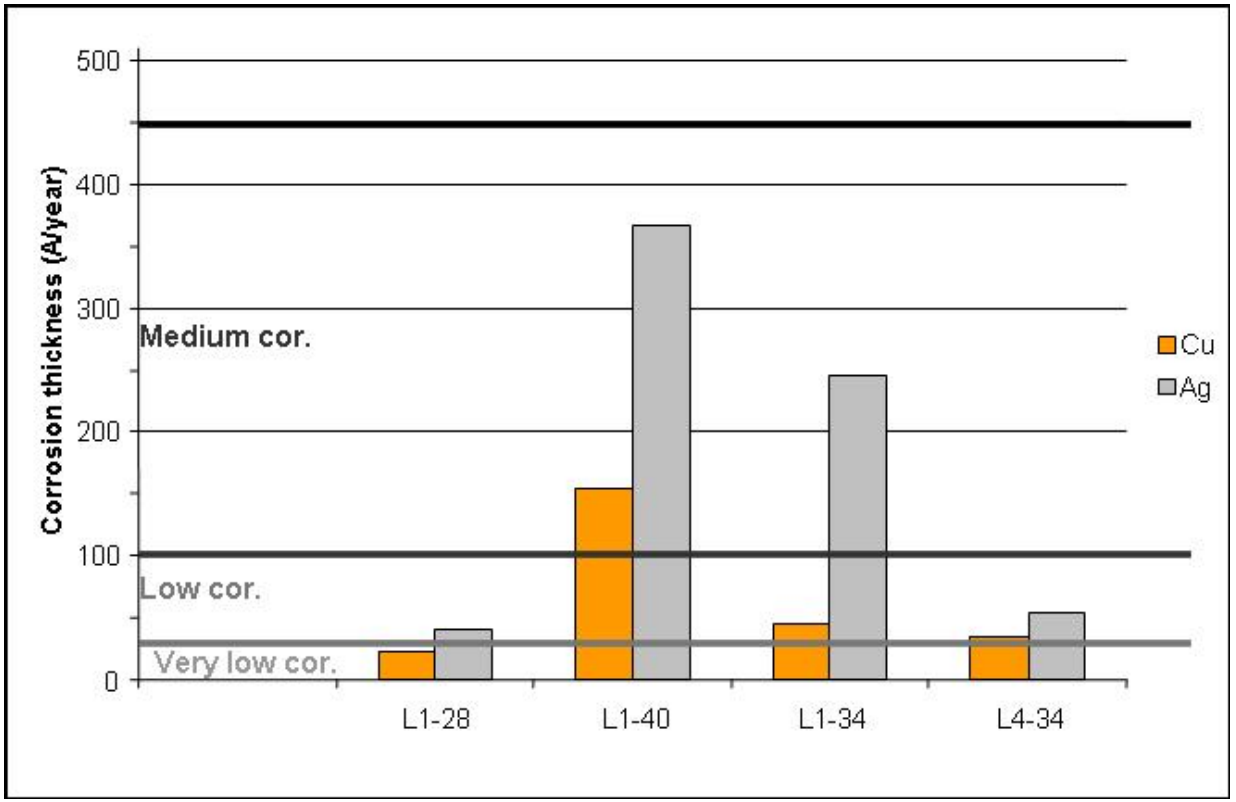
-Acidic pollution = acidic books ?

Comparison outdoor/indoor



Indoor air corrosivity sometimes higher than outdoor

Comparison with ISO 11844



Classification of low corrosivity of indoor atmospheres -- Part 1: Determination and estimation of indoor corrosivity

Air filtration systems

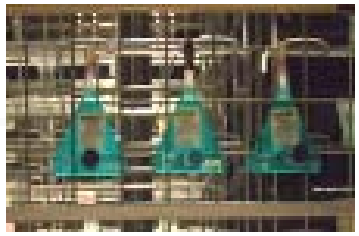
-Volume of a storage room : 2 500m^3

-Air exchange rate : 4 vol./hour

-Air recycling rate (not filtered) : 90%

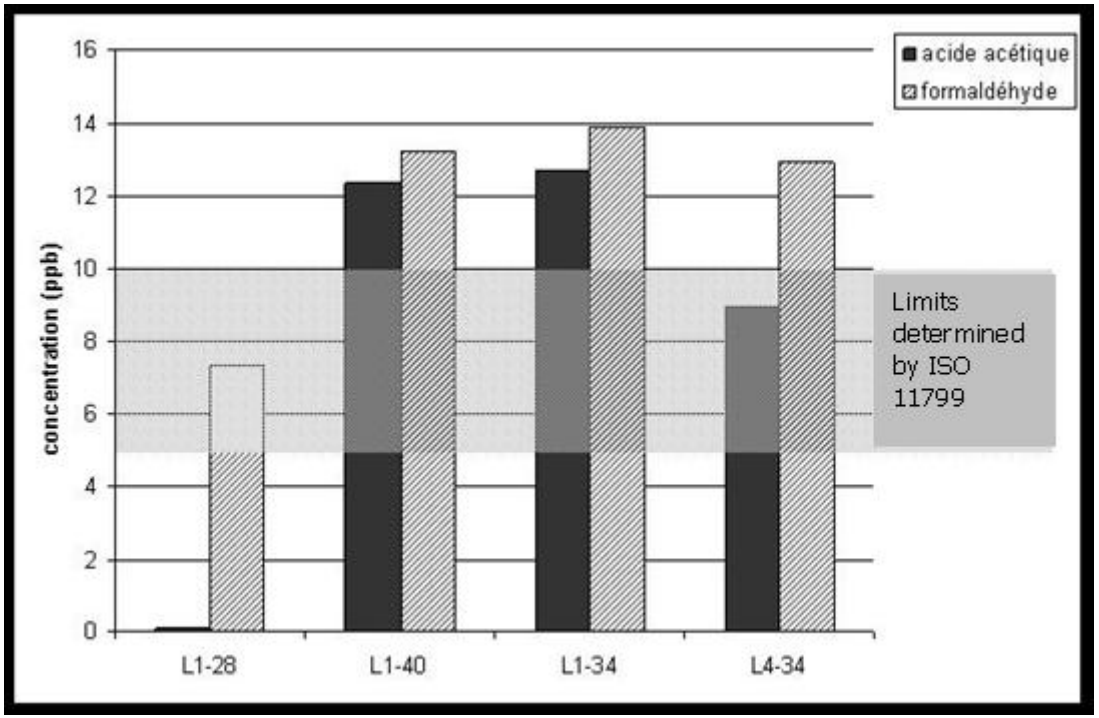
Conclusion : high indoor pollutants concentrations due to the absence of filtration of the recycled air.

VOC's analysis



µg/m3	L1-28 *Audiovisuel items*	L1-40 *Magazines in boxes*	L1-34 *19th newspapers in boxes*	L4-34 *19th and 20th books*
Formaldehyde	9,8 µg/m3	17,7	18,6	17,3
hexaldehyde	8,8	41,9	26	10,1
hexanal	2,3	13,2	8,7	2,7
Alcanes	12,1	1,4	1,7	1,0
Toluene	44,8	7,9	3,0	7,4
Acetic acid	<10	33	34	24
Formic acid	<10	<10	<10	<10
Sulfuric acid, hydrogen sulfide	<10	<10	<10	<10

Comparison with ISO 11799



ISO 11799 : Information and documentation. Document storage requirements for archive and library materials

Conclusion

- Indoor VOC's shall be taken into account
- Conception of air purification systems for archives and libraries shall be specified in standards
- VOC's emitted by the materials used for conditioning shall be specified in standards →protocols for quality control of preservation materials shall be developped

Aknowledgements

- Michel Dubus (C2RMF, France)
- Laurent Pichon (C2RMF, France)
- Jean Michel Brarda-Wieber (Puratch, France)
- Richard Corel, Rene van Dijk – (Purafil, The Netherlands)