200 years of industrial progress
200 ans de progrès industriel

الومنيوم قطر
Qatalum

fives solios

Emissions Processing at QATALUM Smelter

By *Fives Solios*

Setting New Environmental Standards

Author: Bassam HUREIKI (Key account Manager Solios Environnement SA)

200 years of industrial progress
200 ans de progrès industriel

fives solios

Summary

1- Fives Solios – brief overview

2- QATALUM Smelter – brief overview

3- Reduction Area Emissions (Potrooms & GTCs)

4- Carbon Area Emissions (FTC & GAP)

5- Conclusion

200 years of industrial progress
200 ans de progrès industriel

fives solios

Summary

1 – Fives Solios

Gas Treatment Center (GTC) for Electrolysis Pots

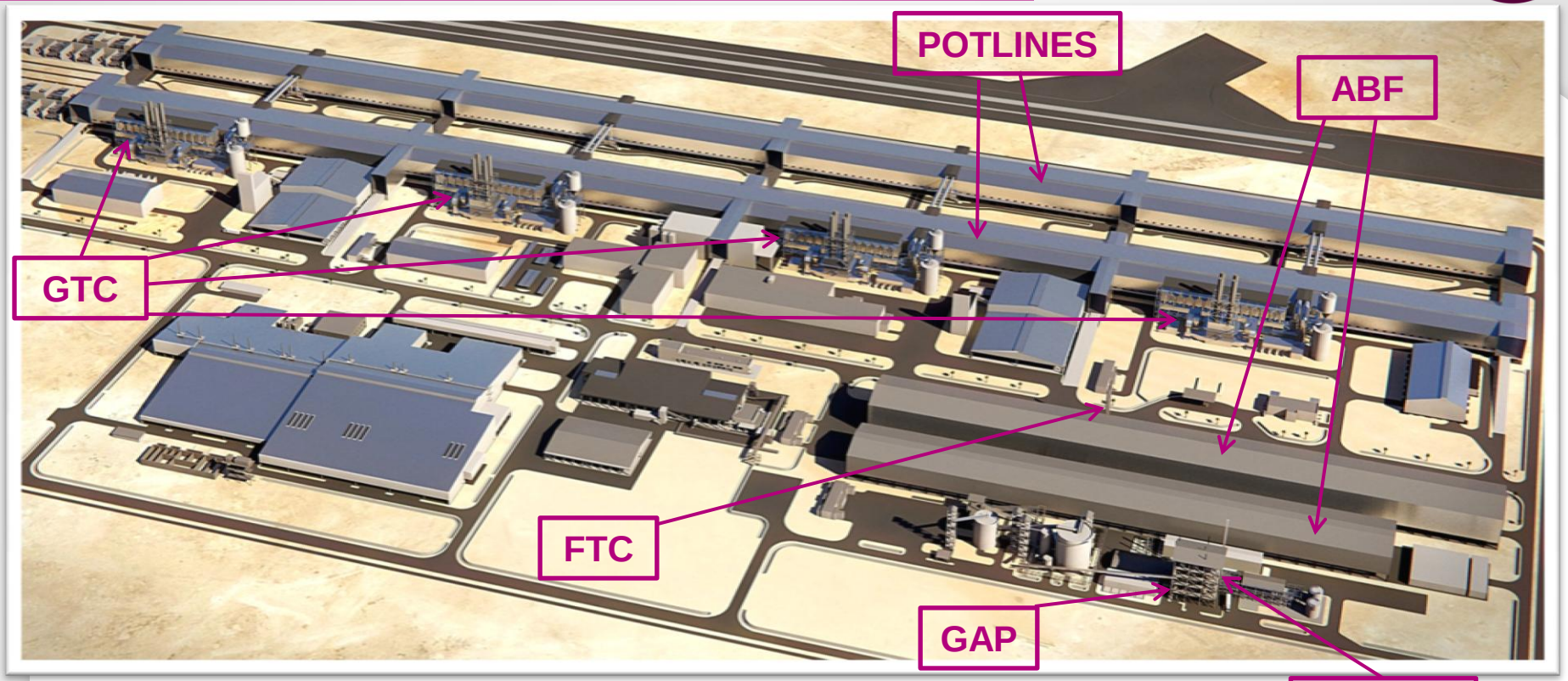
Fume Treatment Center (FTC) for Anode Baking Furnace (ABF)

Pitch Fume Treatment System (PFTS) for Paste Plant

fives solios

Summary

2- QATALUM Smelter – brief overview



QATALUM in brief :
(50% HYDRO, 50% QATAR PETROLEUM)

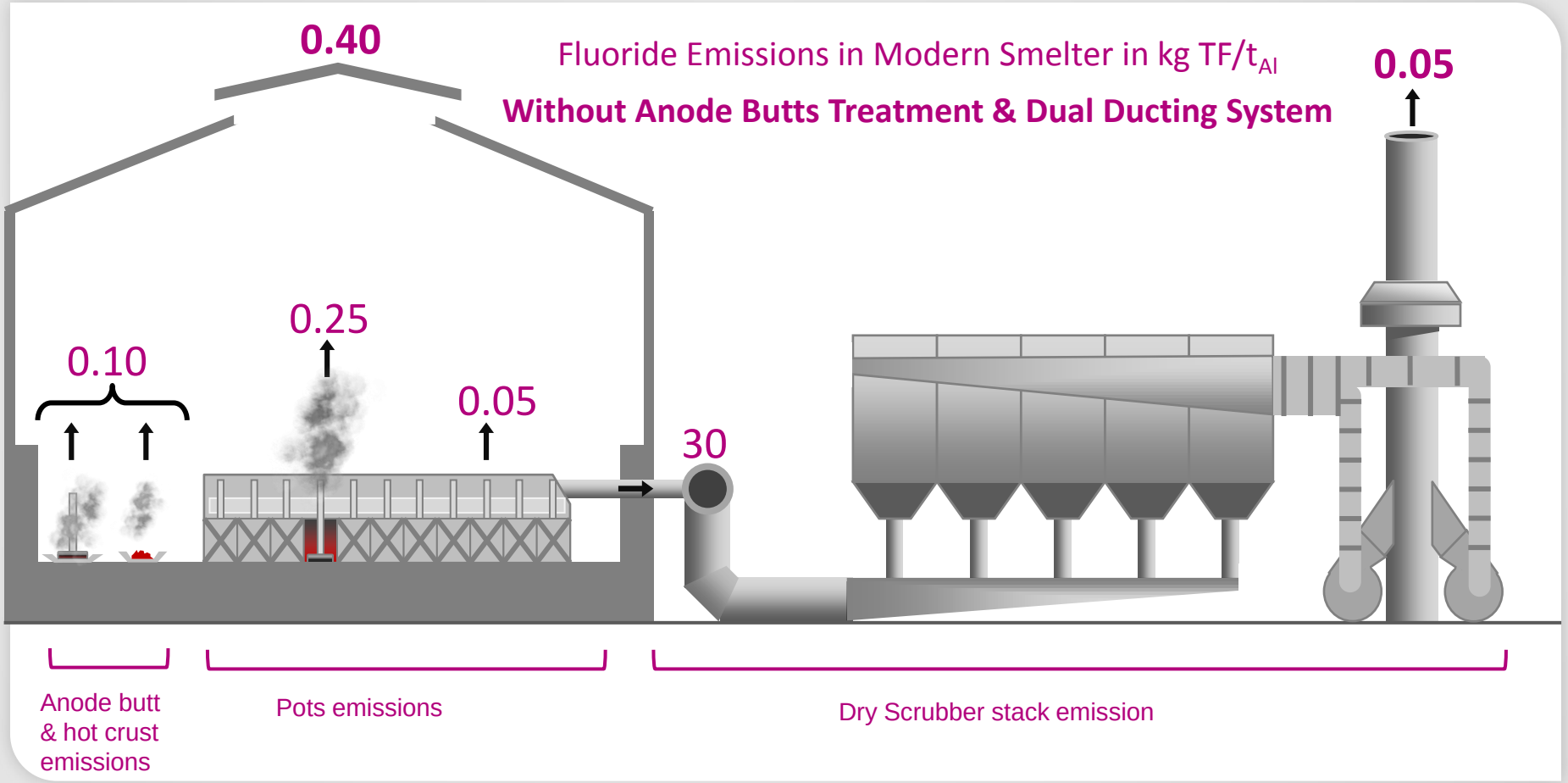
- 585,000 T Al/year
- 2 Potlines → Roof emissions
- 704 HAL275 Cells (300 kA) → 4 GTCs
- 2 Anode Baking Furnaces → 1 FTC
- 1 Green Anode Plant (60T/h) → 1 EOLIOS

fives solios

Summary

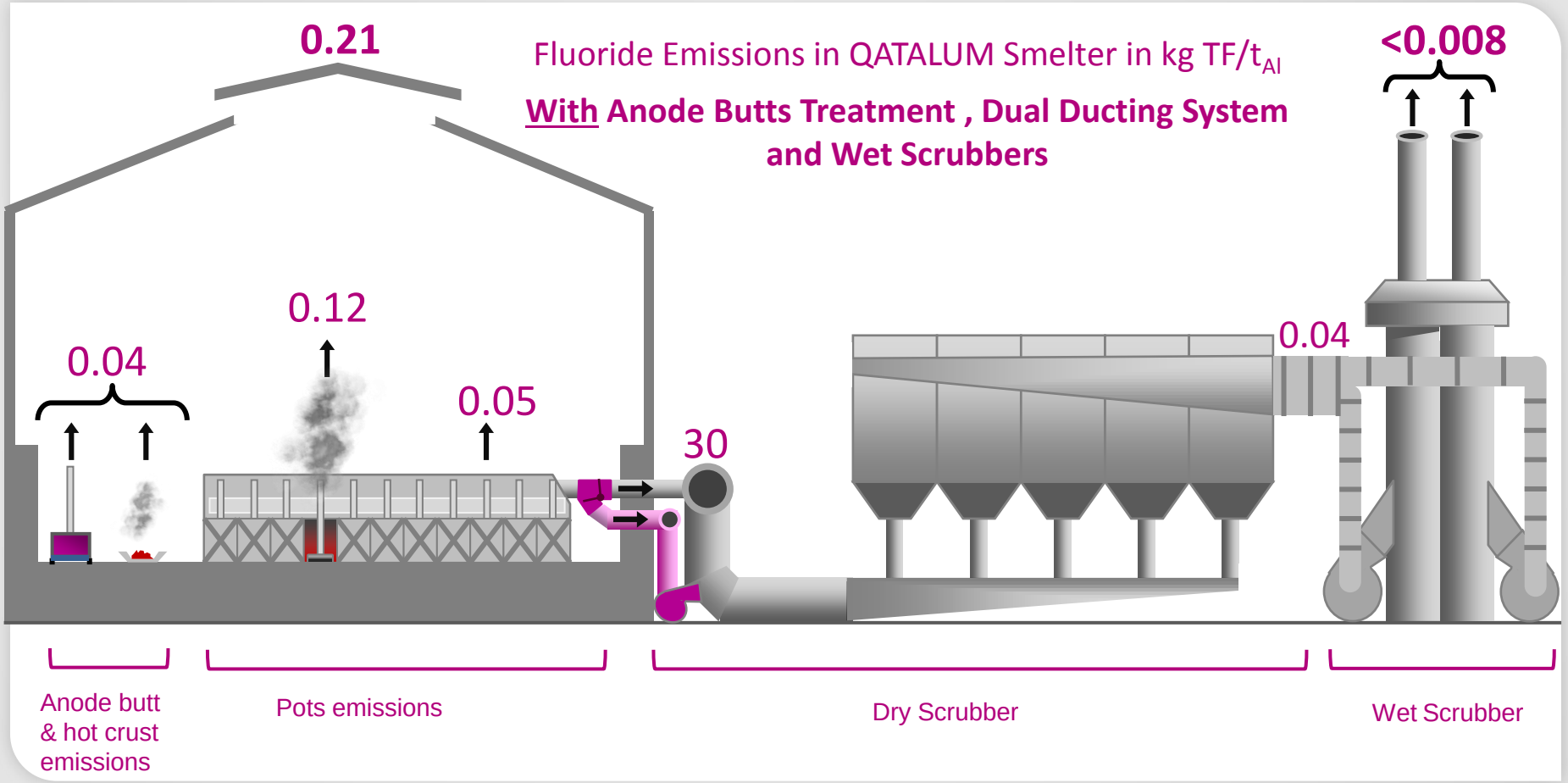
3- Reduction Area Emissions

Potrooms Fluoride Emissions



3- Reduction Area Emissions

Potrooms Fluoride Emissions

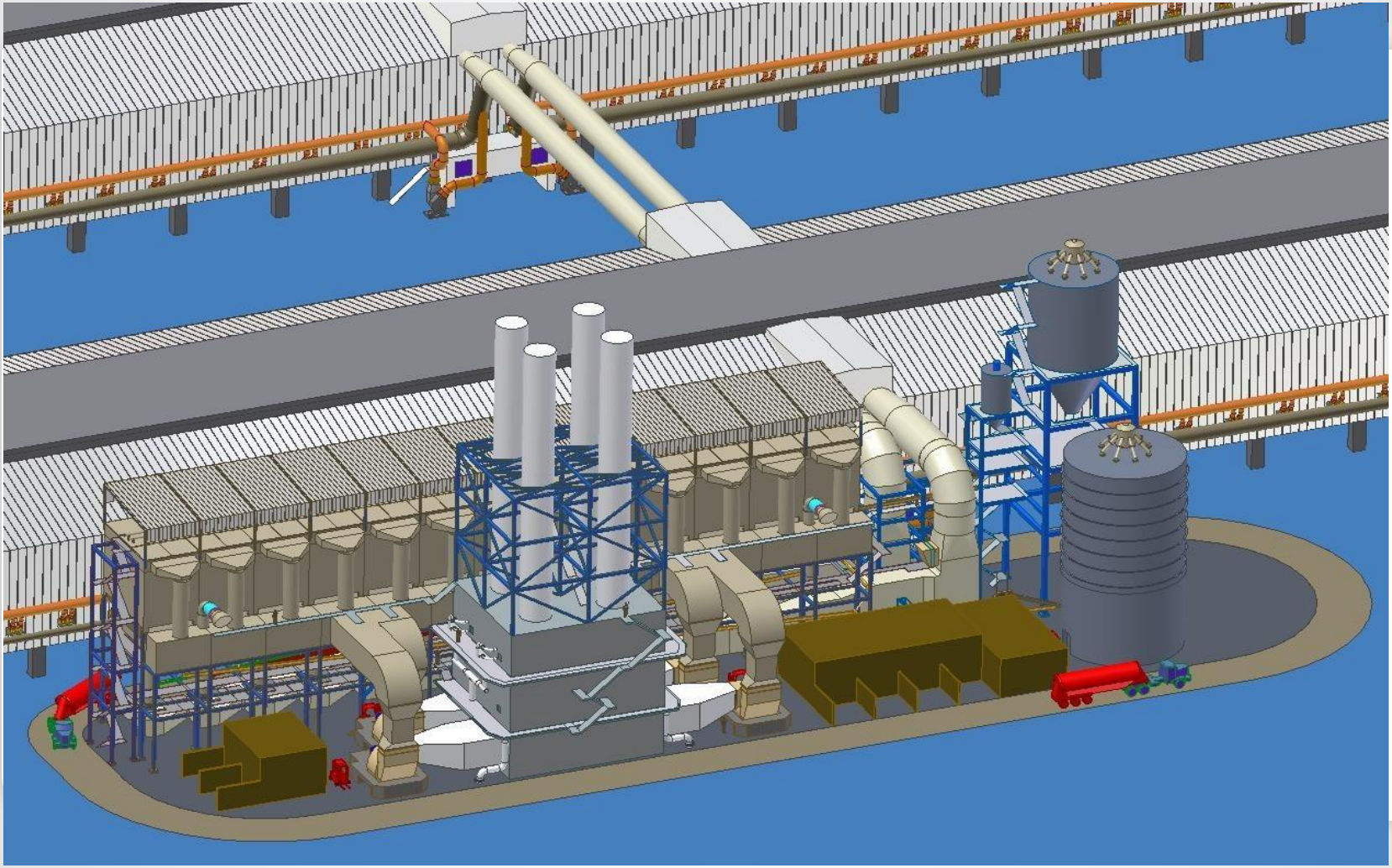


3- Reduction Area Emissions
GTCs, Fluoride Emissions

- Turn-key supply of 4 GTCs including for each:
  - Connecting ducts from 176 pots to GTC including Dual Ducting System (YPRIOS)
  - 13 TGT-RI filters treating 1.4 million Nm^3/h of gas
  - 4 concrete SO_2 Wet Scrubbers using sea water
  - Alumina handling systems

3- Reduction Area Emissions

GTCs, Fluoride Emissions



3- Reduction Area Emissions

GTCs, Fluoride Emissions

3- Reduction Area Emissions
GTCs, Fluoride Emissions

- Guaranteed Values:
  - Pots gas flow : Normal suction minimum 7,000 Nm^3/h @ 170°C
    Over suction minimum 18,000 Nm^3/h
  - Pollutants Emissions Required by QATALUM, among the most stringent in the world:

Pollutants Emissions	Raw gas concentration at pot outlets (mg/Nm^3)	After Dry Scrubber (mg/Nm^3)	After Wet Scrubber (mg/Nm^3)
Gaseous Fluoride	275	0.5	0.1
Particulate Fluoride	205	0.3	0.2
Total Dust	950	3	2
SO_2	275	NA	35

3- Reduction Area Emissions
GTCs, Fluoride Emissions

- Measured values during Performance Test of GTC1 (June 2011):

Pollutants Emissions	After Dry Scrubbers mg/Nm³	mg/Nm³	After Wet Scrubbers mg/Nm³	mg/Nm³
Gaseous Fluoride	0.14	✓ (0.5)	0.02	✓ (0.1)
Particulate Fluoride	0.01	✓ (0.3)	0.05	✓ (0.2)
Total Dust	0.28	✓ (3.0)	0.75	✓ (2.0)
SO_2	NA		6.7	✓ (35)

- Measured values during Performance Test of GTC2 (October 2011):

Pollutants Emissions	After Dry Scrubbers mg/Nm³	mg/Nm³	After Wet Scrubbers mg/Nm³	mg/Nm³
Gaseous Fluoride	0.24	✓ (0.5)	0.04	✓ (0.1)
Particulate Fluoride	0.07	✓ (0.3)	0.02	✓ (0.2)
Total Dust	0.8	✓ (3.0)	0.39	✓ (2.0)
SO_2	NA		10.9	✓ (35)

3- Reduction Area Emissions
GTCs, Fluoride Emissions

- Measured values during Performance Test of GTC3 (March 2012):

Pollutants Emissions	After Dry Scrubbers mg/Nm³	mg/Nm³	After Wet Scrubbers mg/Nm³	mg/Nm³
Gaseous Fluoride	0.21	✓ (0.5)	0.03	✓ (0.1)
Particulate Fluoride	0.04	✓ (0.3)	0.02	✓ (0.2)
Total Dust	0.38	✓ (3.0)	0.20	✓ (2.0)
SO_2	NA		2.7	✓ (35)

- Measured values during Performance Test of GTC4 (March 2012):

Pollutants Emissions	After Dry Scrubbers mg/Nm³	mg/Nm³	After Wet Scrubbers mg/Nm³	mg/Nm³
Gaseous Fluoride	0.3	✓ (0.5)	0.02	✓ (0.1)
Particulate Fluoride	0.07	✓ (0.3)	0.02	✓ (0.2)
Total Dust	0.78	✓ (3.0)	0.28	✓ (2.0)
SO_2	NA		9.3	✓ (35)

3- Reduction Area Emissions
GTCs, Fluoride Emissions

➔ Conclusion:

› Pollutants Emissions requested by QATALUM are among the lowest in the world and the measured ones (by a third party) are for all GTCs 3 to 6 times under the Required values:

Pollutants Emissions	Mean Value for 4 GTCs after Dry Scrubber (mg/Nm^3)	Required figures after filters (mg/Nm^3)
Gaseous Fluoride	0.22	✓ 0.5
Particulate Fluoride	0.05	✓ 0.3
Total Dust	0.56	✓ 3.0
SO_2	NA	NA

3- Reduction Area Emissions
GTCs, Fluoride Emissions

- Conclusion:
  - Pollutants Emissions requested by QATALUM are among the lowest in the world and the measured ones (by a third party) are for all GTCs 3 to 6 times under the Required values:

Pollutants Emissions	Mean Value for 4 GTCs after Wet Scrubber (mg/Nm^3)	Required figures @ Stacks (mg/Nm^3)
Gaseous Fluoride	0.03	✓ 0.1
Particulate Fluoride	0.03	✓ 0.2
Total Dust	0.4	✓ 2.0
SO_2	7.4	✓ 35

fives solios

Summary

3- Carbon Area Emissions

FTC, Fluoride & PAH Emissions

- Turn-key supply on 2 Anode Baking Furnaces of :
  - 2 Firing Control Systems
  - 1 FTC treating 220,000 Nm^3/h of both ABFs fumes and consisting of :
    - 1 Cooling Tower with water injection system
    - 7 TGT-RI filters
    - 4 ID Fans
    - 1 main stack
    - 2 (1 per ABF) emergency by-pass stacks and emergency Diesel fans
    - Amumina handling systems

3- Carbon Area Emissions

FTC, Fluoride & PAH Emissions

3- Carbon Area Emissions

FTC, Fluoride & PAH Emissions

3- Reduction Area Emissions
FTC, Fluoride & PAH Emissions

- Guaranteed Values:
  - Pollutants Emissions Required by QATALUM, among the most stringent in the world:

Pollutants Emissions	Raw gas concentration at furnaces outlets (mg/Nm^3)	Required figures @ Stack (mg/Nm^3)
Gaseous Fluoride	20 to 100	0.5
Particulate Fluoride	20 to 100	0.5
Total Dust	20 to 200	5
16 PAH* (NS9815)	10 to 65	1

* The 16 PAH according to NS 9815 are:
1. Phenanthrene
2. Anthracene
3. Fluoranthene
4. Pyrene
5. Benzo (a) fluorene
6. Benzo (b) fluorene
7. Benzo (a) anthracene
8. Chrysene / Triphenylene
9. Benzo (b) fluoranthene
10. Benzo (k) fluoranthene
11. Benzo (e) pyrene
12. Benzo (a) pyrene
13. Indeno (1,2,3,-cd) pyrene
14. Dibenzo (a,h/a,c) anthracene
15. Benzo (g,h,I) perylene
16. Dibenzo (a,e/a,h/a,i)) pyrene

3- Reduction Area Emissions
FTC, Fluoride & PAH Emissions

- Measured values during Performance Test of FTC (December 2011):

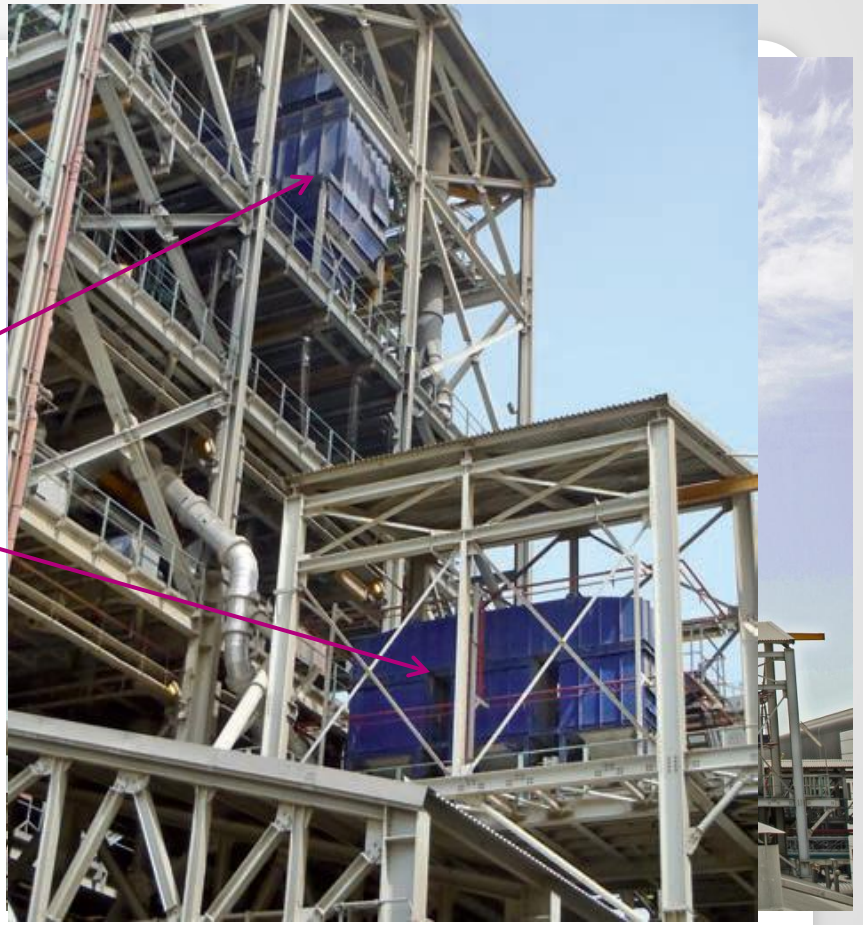
Pollutants Emissions	Measured Values Mean mg/Nm³	Measured Values Maximum mg/Nm³	Comply with Required figures mg/Nm³
Gaseous Fluoride	0.18	0.31	✓ 0.5
Particulate Fluoride	0.01	0.02	✓ 0.5
Total Dust	1.9	2.3	✓ 5.0
16 PAH (NS9815)	0.25	0.7	✓ 1.0

- Conclusion:
  - Pollutants Emissions Required by QATALUM are among the lowest in the world and the measured ones (by a third party) are far underneath the guaranteed values.

3- Carbon Area Emissions

EOLIOS, PAH Emissions

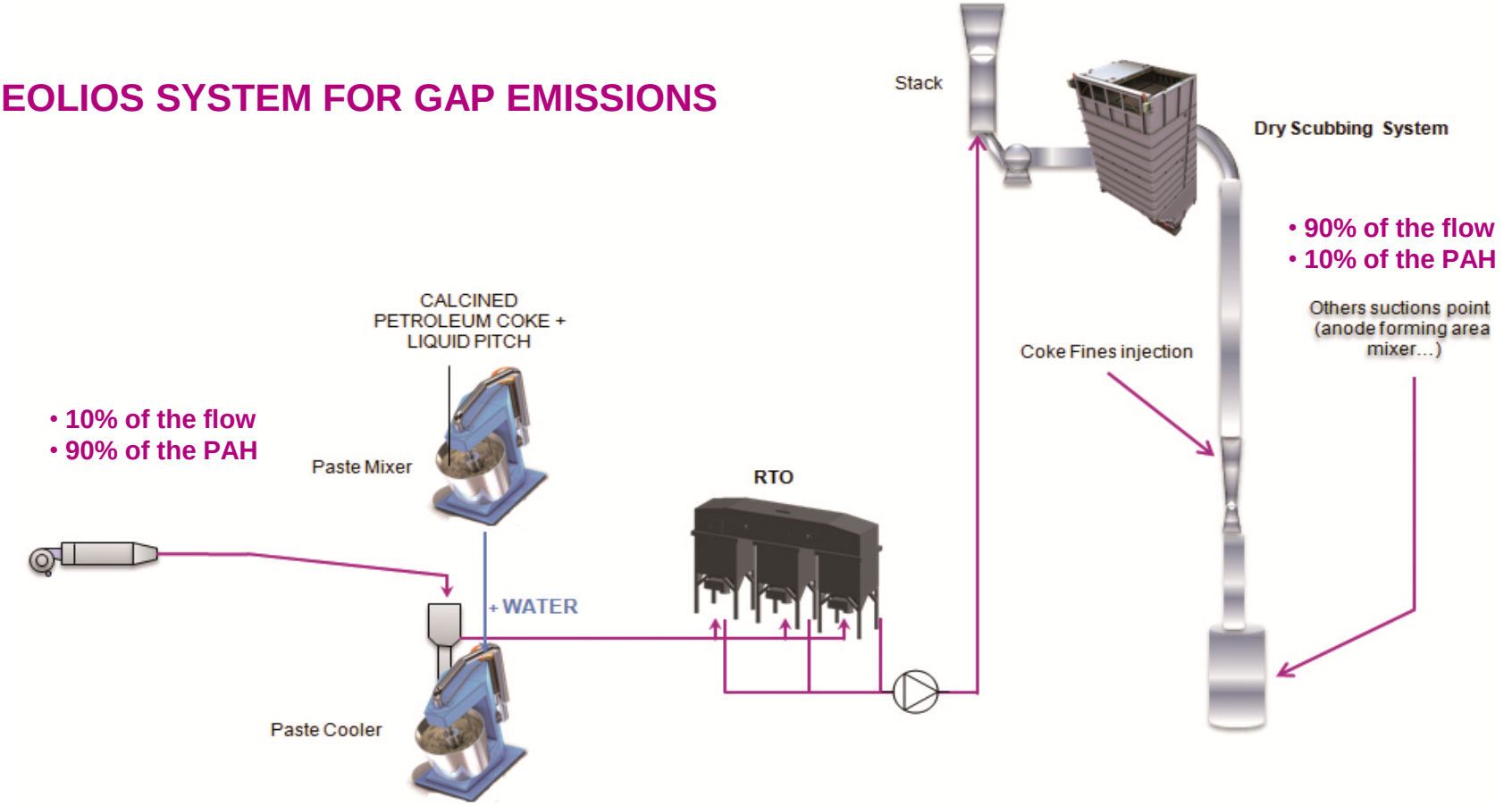
- 60 T/h GAP including Fives Solios Pitch Fumes Treatments called EOLIOS
- EOLIOS, the right treatment for the right source:
  - 45,800 Nm^3/h of low PAH concentration fumes treated in conventional coke dry scrubber
  - 5,200 Nm^3/h of high PAH concentration fumes treated in Regenerative Thermal Oxidizer (RTO)
- This combination minimizes the energy consumption and the PAH emissions.
- Facility started in 2010.



3- Carbon Area Emissions

EOLIOS, PAH Emissions

EOLIOS SYSTEM FOR GAP EMISSIONS



3- Reduction Area Emissions
EOLIOS, PAH Emissions

- Measured values during Performance Test of EOLIOS

Pollutants Emissions	Measured Values mg/Nm^3	Comply with Required figures mg/Nm^3
Total Dust	4.52	✓ 10
16 PAH (NS9815)	0.96	✓ 1.0

- Conclusion:
  - Pollutants Emissions Required by QATALUM are among the lowest in the world and the measured ones (by a third party) are in conformity with the guaranteed values.

200 years of industrial progress
200 ans de progrès industriel

fives solios

Summary

5- CONCLUSION

- ✓ **Fives Solios has treated successfully the main sources of emissions in the QATALUM Smelter,**
- ✓ **QATALUM has settled a new environmental standard for primary aluminium smelters.**