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THE 6TH GPCA FERTILIZER CONVENTION

14-16 September 2015 • InterContinental Dubai - Festival City, UAE

Innovating for growth: Ensuring an efficient, sustainable future

THE 6TH GPCA FERTILIZER CONVENTION

Production of HF from H_2SiF_6

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BUSS CHEMTECH Process Technologies | KRESTA industries

Who We Are

BUSS CHEMTECH Process Technologies | KRESTA industries

Technology Engineering	Key Equipment	Startup Consulting	Pilot/Lab Trials

Catalytic Gas-Liquid Reaction Technology

Dynamic Phosgene Production

Green Anode Plants

Fluorine Technology

Why use (FSA) to produce HF ?

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- Processing costs and investment costs of fluorspar processing plants will increase with decreasing fluorspar quality (Particle size and impurities are linked to each other)
- Lower fluorspar exports from China
- Producers with own high quality fluorspar sources and written off plants can continue to operate economically
- Investors in new plants should seriously consider the route from FSA

Fluorosilicic Acid – Potential for Anhydrous HF (AHF) Production

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- Waste from the production of Phosphoric Acid (PA)
- Available in large amounts in PA producing plants
- Cheap raw material for production of fluorochemicals (It‘s a waste!)
- Theoretically, the current production of AHF worldwide (approx. 2 mio t/a, almost entirely from fluorspar) could be produced with FSA as raw material

Fluorosilicic Acid (FSA) – Current Use

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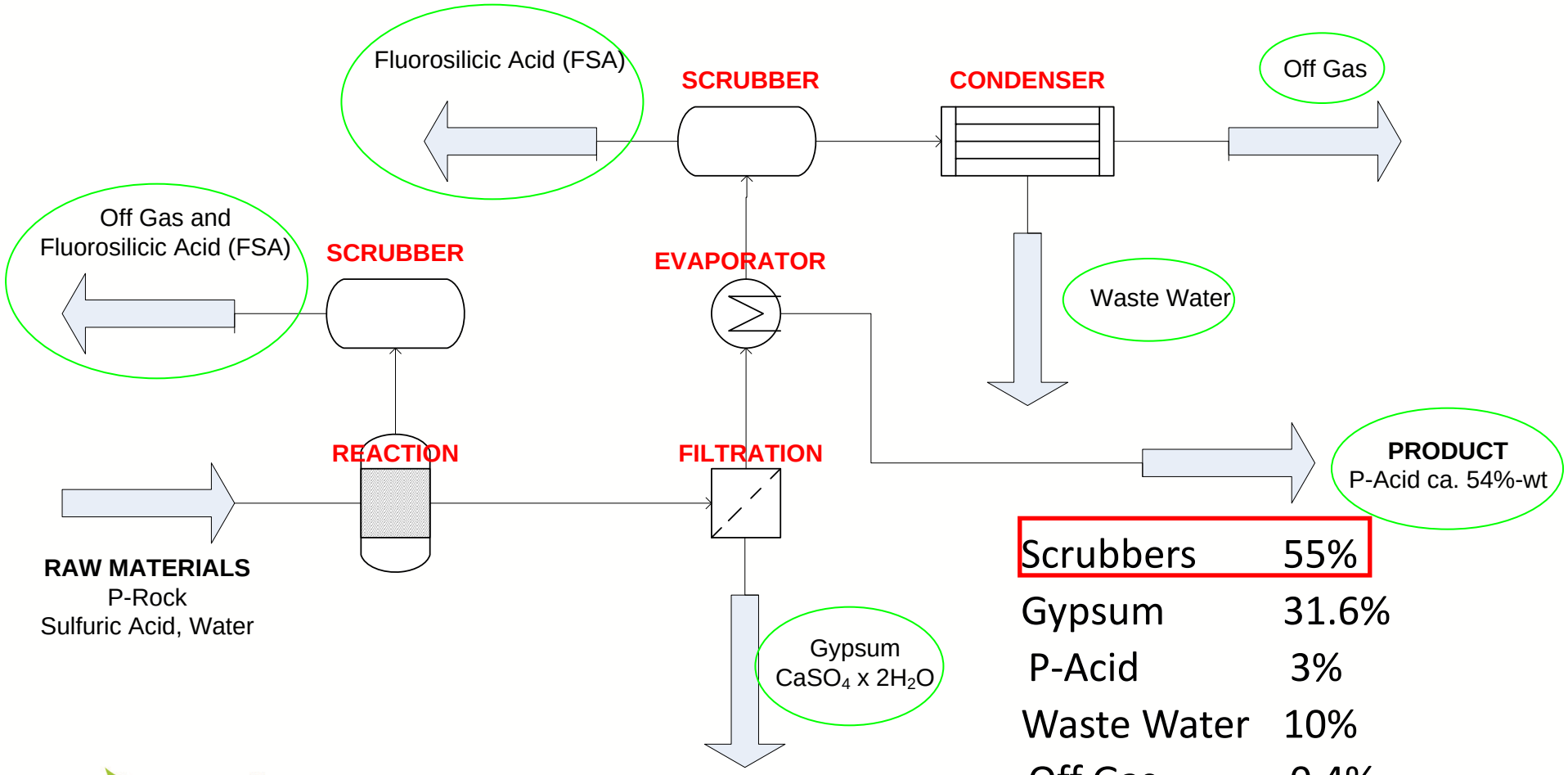
- Aluminium Fluoride (AlF_3), LBD
- Metal Fluorosilicates
- Drinking Water Fluorination
- Preservation of Timber
- Disinfection of brewery equipment
- Concrete Hardening (Magnesium Salt)
- Insecticide

Typical F Distribution in the Dihydrate Phosphoric Acid Process



Scrubbers	55%
Gypsum	31.6%
P-Acid	3%
Waste Water	10%
Off Gas	0.4%

HF Production from FSA

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Two ways have been researched within the last six decades and have led to numerous patents

DIRECT REACTION WITH SULPHURIC ACID

REACTION WITH INTERMEDIATE SALT PRECIPITATION

Reaction with Salt Precipitation

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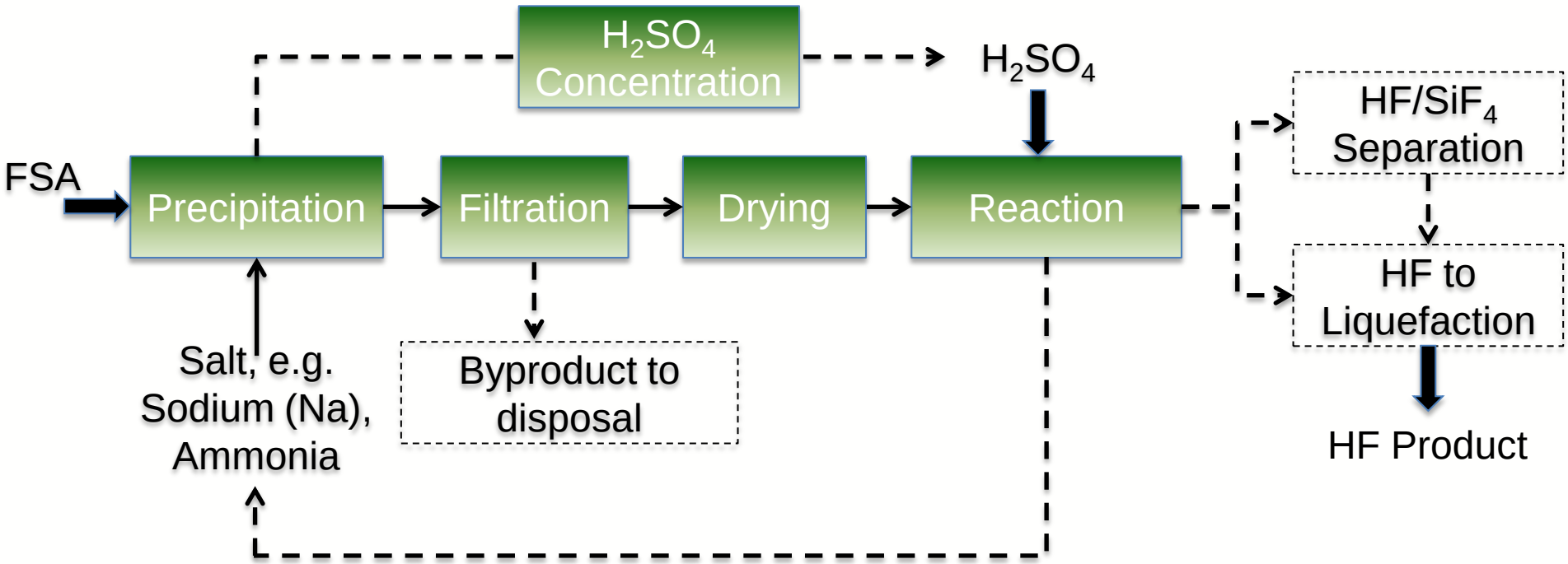

The BCT Process of AHF from FSA

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- BCT cooperation with Polish company: small production plant with a capacity of 800 t/a
- Direct scale-up and process improvement lead to the first full scale industrial plant in China with 20,000 t/a HF production, Startup in 2008
- Two more industrial plants operating in China at capacities of 12,000 t/a and 20,000 t/a
- More plants in project status (worldwide incl. China)

BCT process – block diagram

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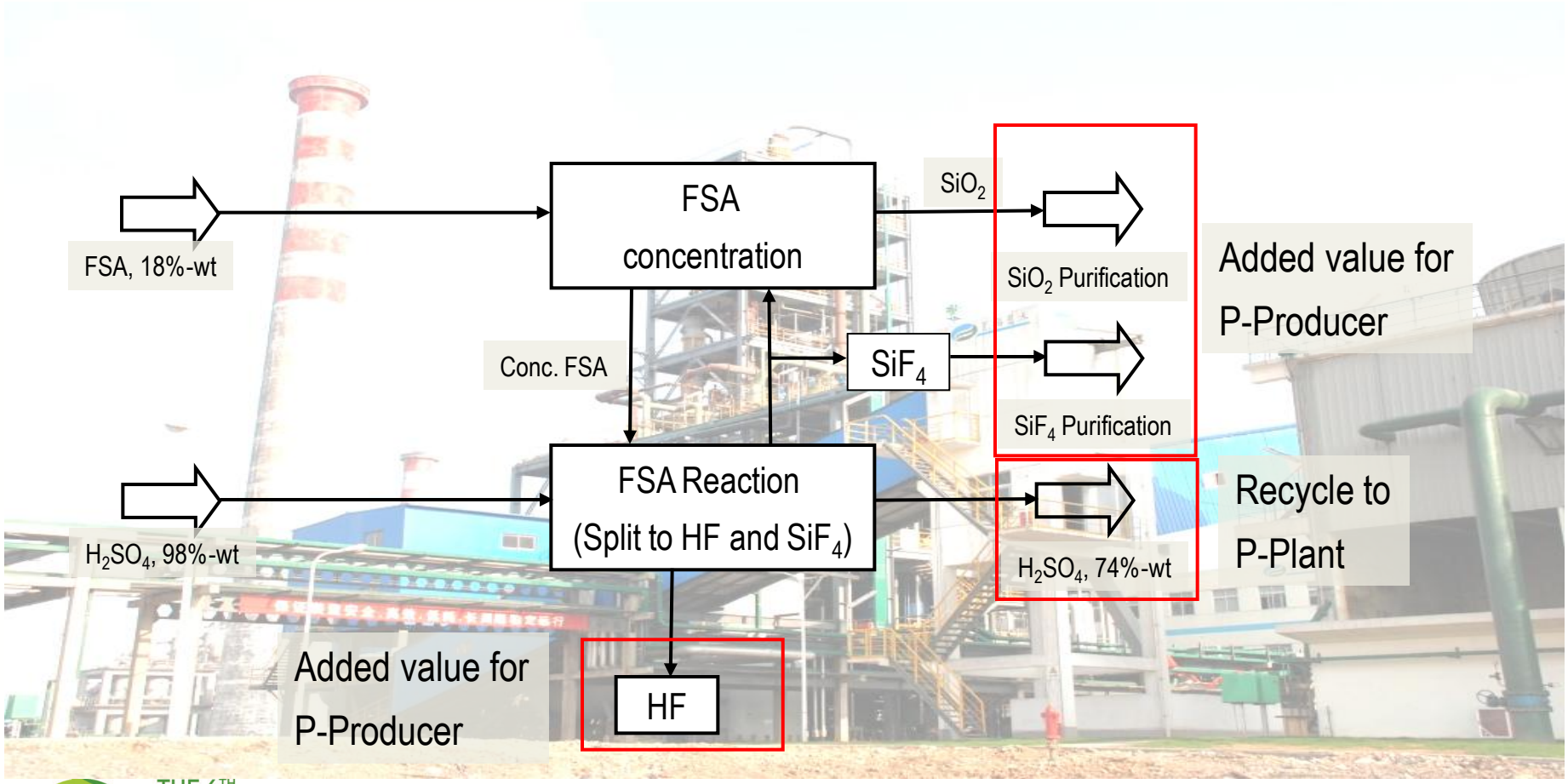

The BCT process – specs

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\+ Simple and robust process
\+ Gas/Liquid reaction and process allows a very efficient purification section and thus high acid quality

– Silica quality not as good as with intermediate salt process. Usage: quality improvement for food grade phosphoric acid
– Quality can be improved by production of waterglass

± Has to be erected adjacent to a phosphoric acid plant
± Diluted sulphuric acid pumped back to phosphoric acid plant

Scaling up from 800 to 20,000 t/a

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- Mass balance of existing small plant by BCT
- Identification of bottlenecks in the existing plant

Results:

- Fluorine recovery found to be 60% of entire F
- SiF_4 losses were found to be too high and were reduced
- Absorption columns were optimised

Requirements for new design:

- H_2SO_4 flows re-routed to achieve better absorption
- Absorption columns interconnected differently, design changed
- Fluorine recovery 90%, SiF_4 losses 0.5% of SiF_4 produced

BCT Operating Full Scale Plants

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20,000 t/a capaci
WengFu Lantian

20,000 t/a capacity
Hubei WengFu Lantian

city
Fujian WengFu Lantian

Product Quality – AHF from FSA

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Mass Fraction, %-wt AHF ex FSA (BCT Reference Plant)		Reference, %-wt AHF from Fluorspar[1]
HF	99.96	99.95
H_2SO_4	0.001 max.	0.01 max.
H_2O	0.005 max.	0.02 max.
H_2SiF_6	0.001 max.	0.01 max.
SO_2	0.001 max.	0.005 max.
P_2O_5	0.001 max.	0.001 max.
As	0.0005 max.	0.0025 max.

[1]From Website of International Manufacturer

Summary

- BCT has successfully scaled up a process to manufacture Anhydrous Hydrogen Fluoride from FSA
- Process efficiency has been improved with regards to the highest possible fluorine recovery
- Plants in industrial scale operate successfully since 2008
- Quality of AHF is equal to that manufactured from fluorspar
- The process is cheaper in operation (Raw material costs) compared to the traditional process using fluorspar
- Make money with your waste

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THANK YOU!

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