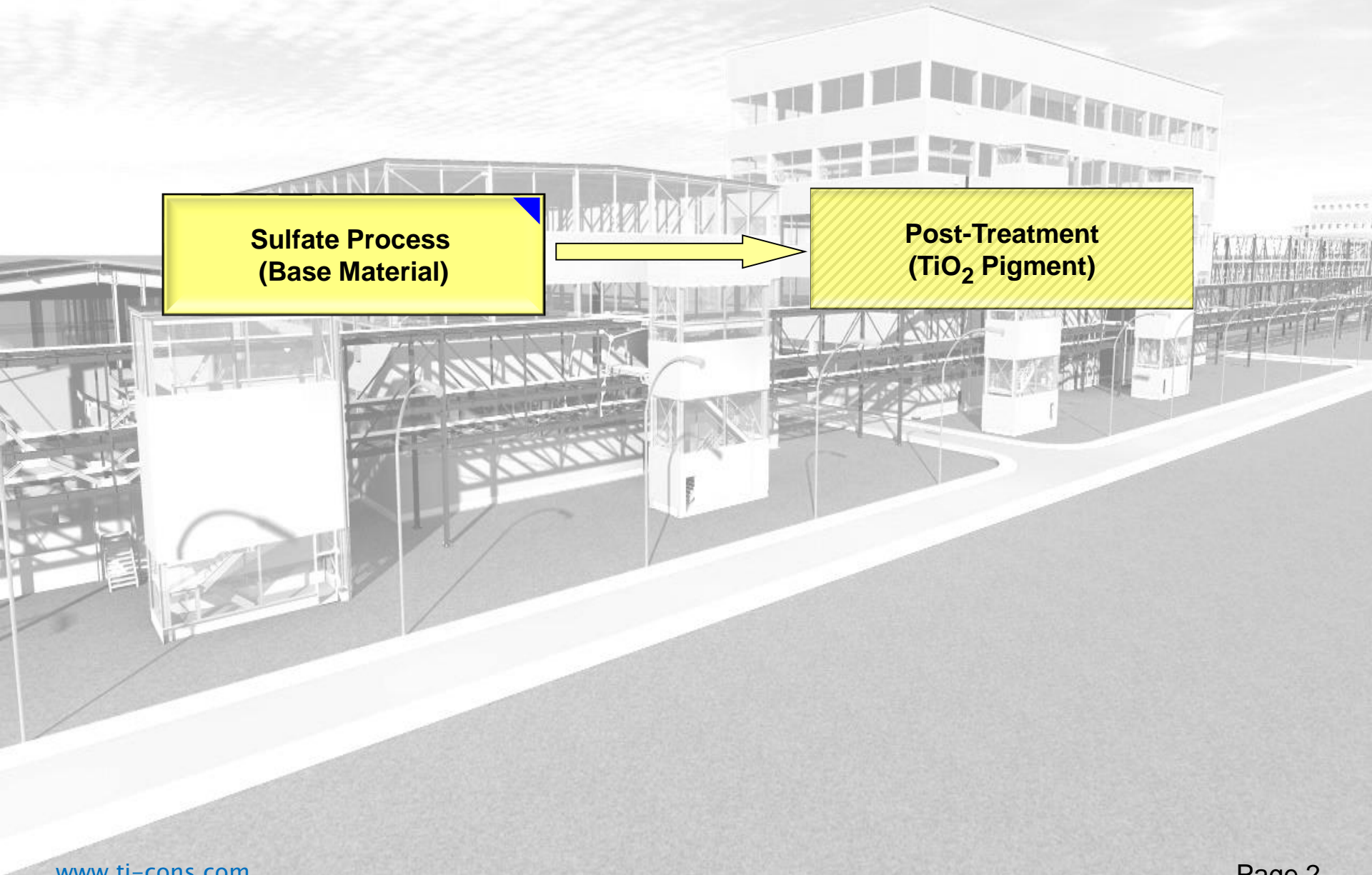


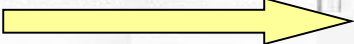
TiO₂ Sulfate Process



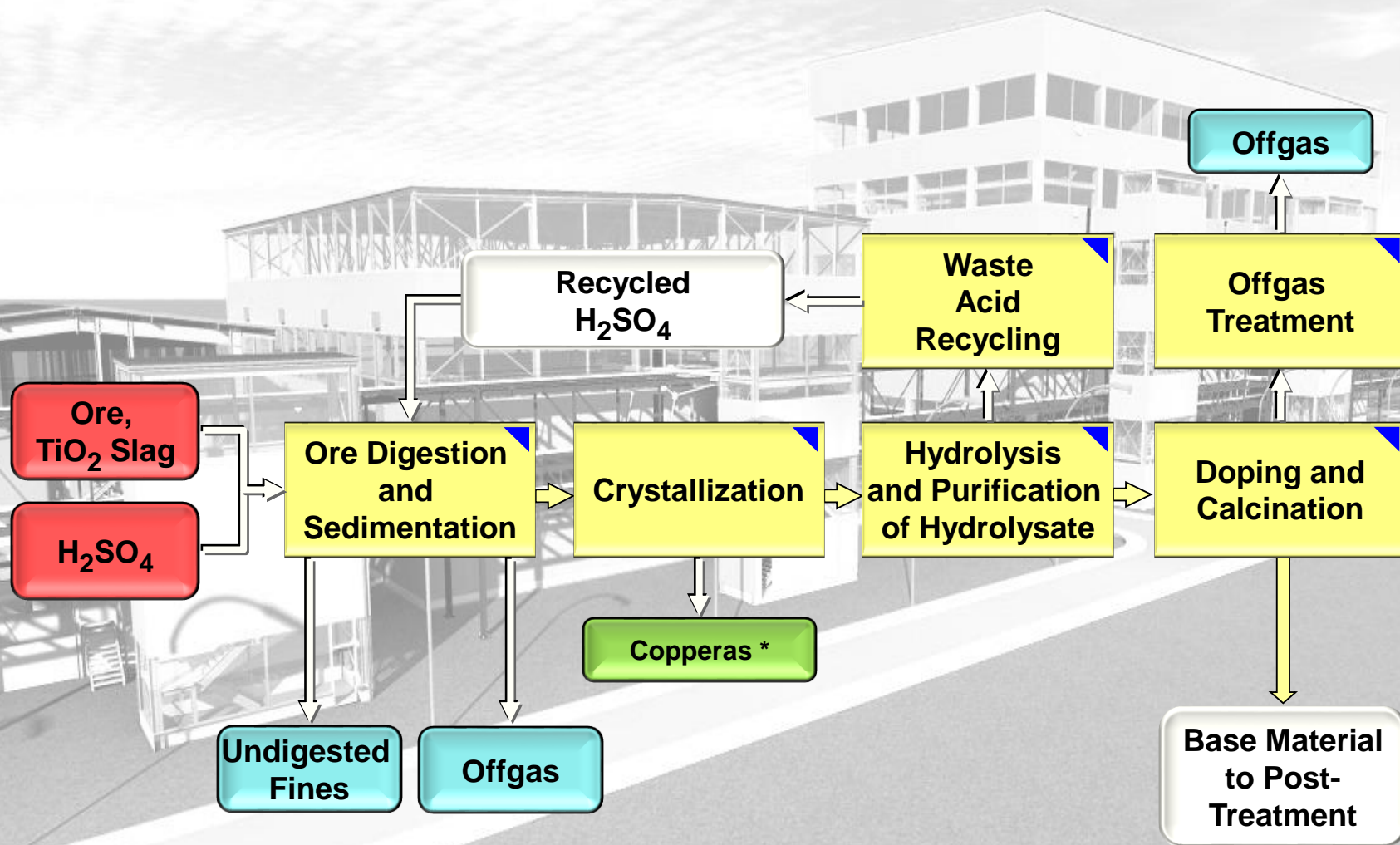
www.Ti-Cons.com



**Sulfate Process
(Base Material)**

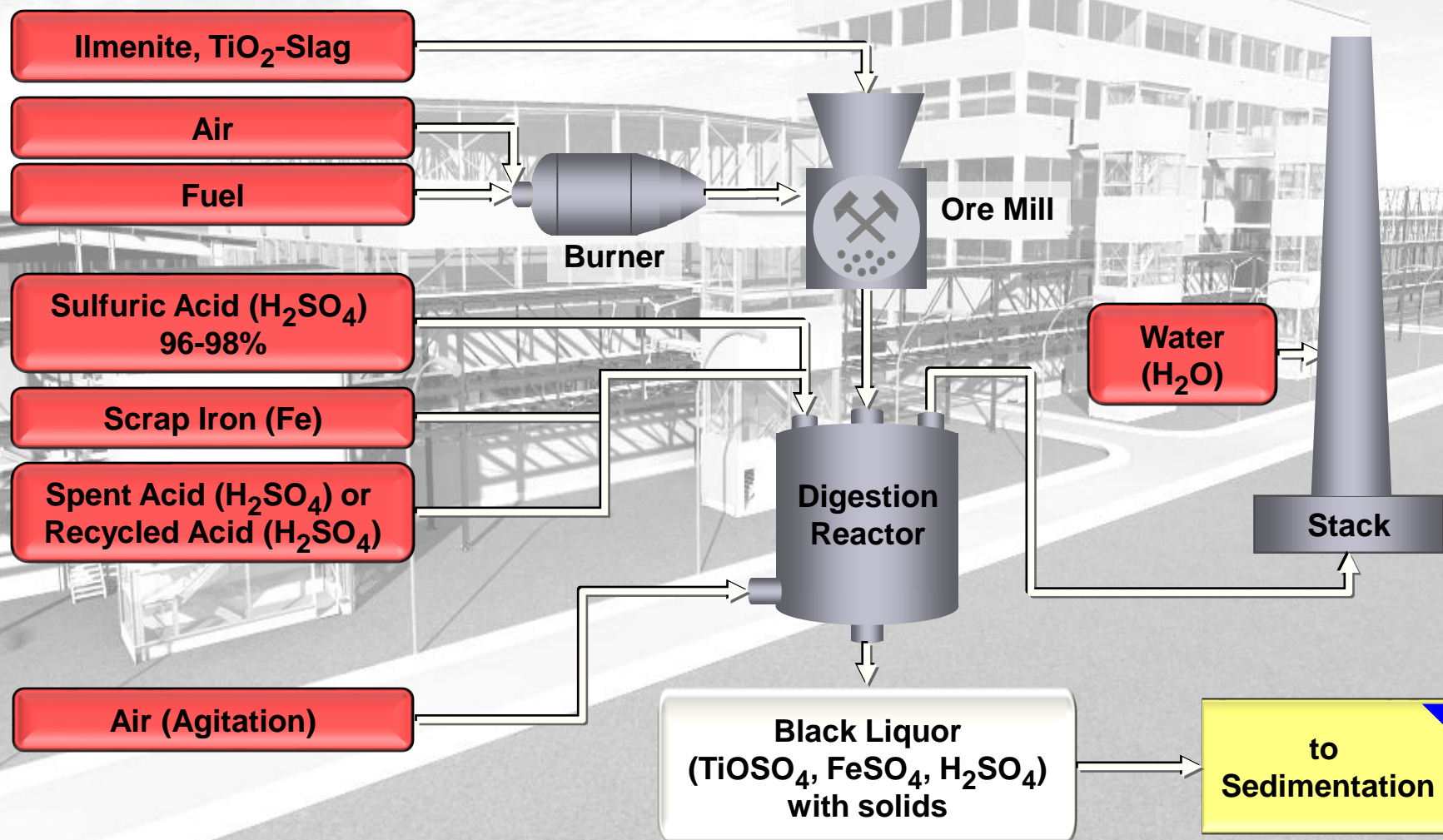


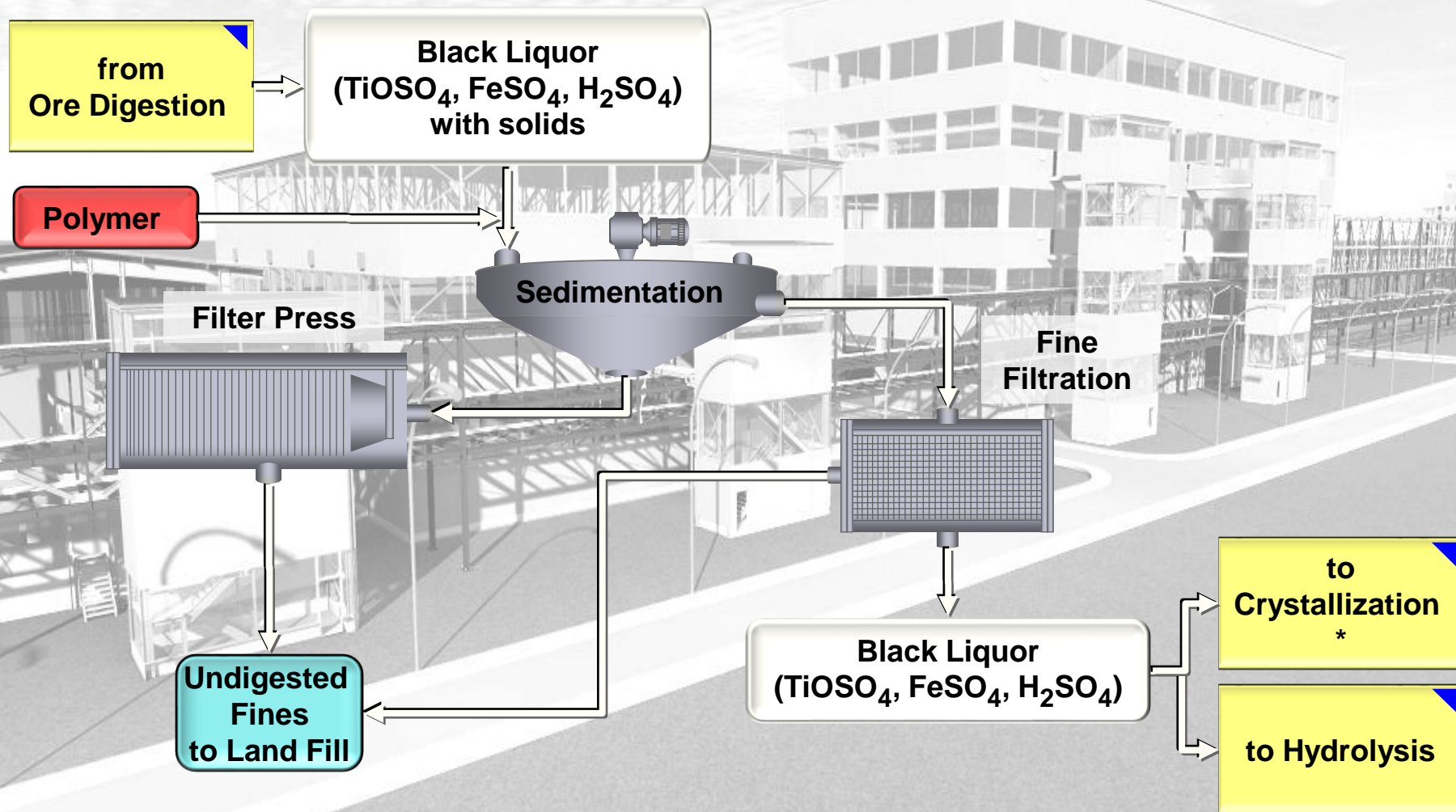
**Post-Treatment
(TiO₂ Pigment)**



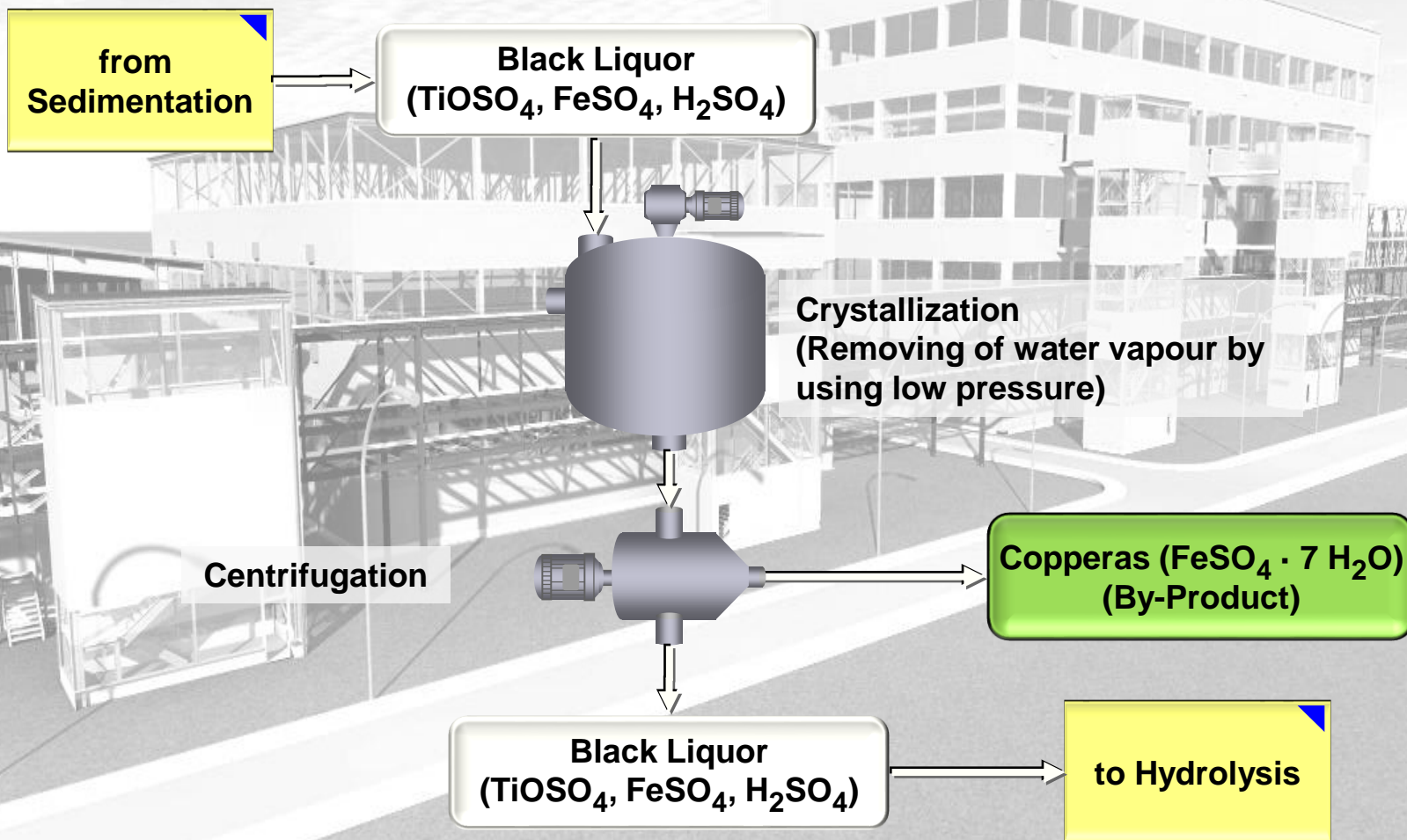
* If TiO₂ slag is used crystallization isn't necessary

Symbols: Educts Intermediates By-Product Waste



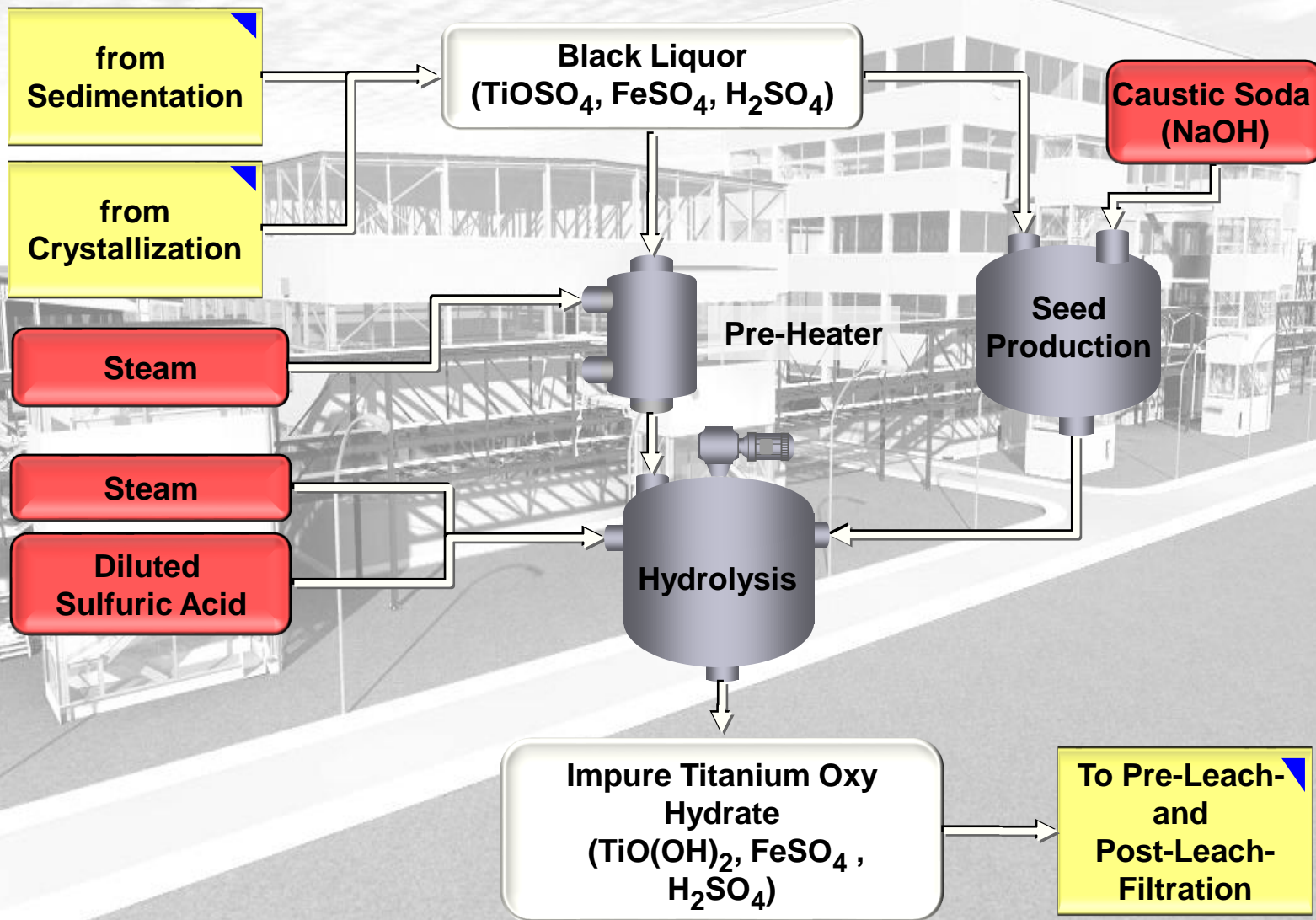


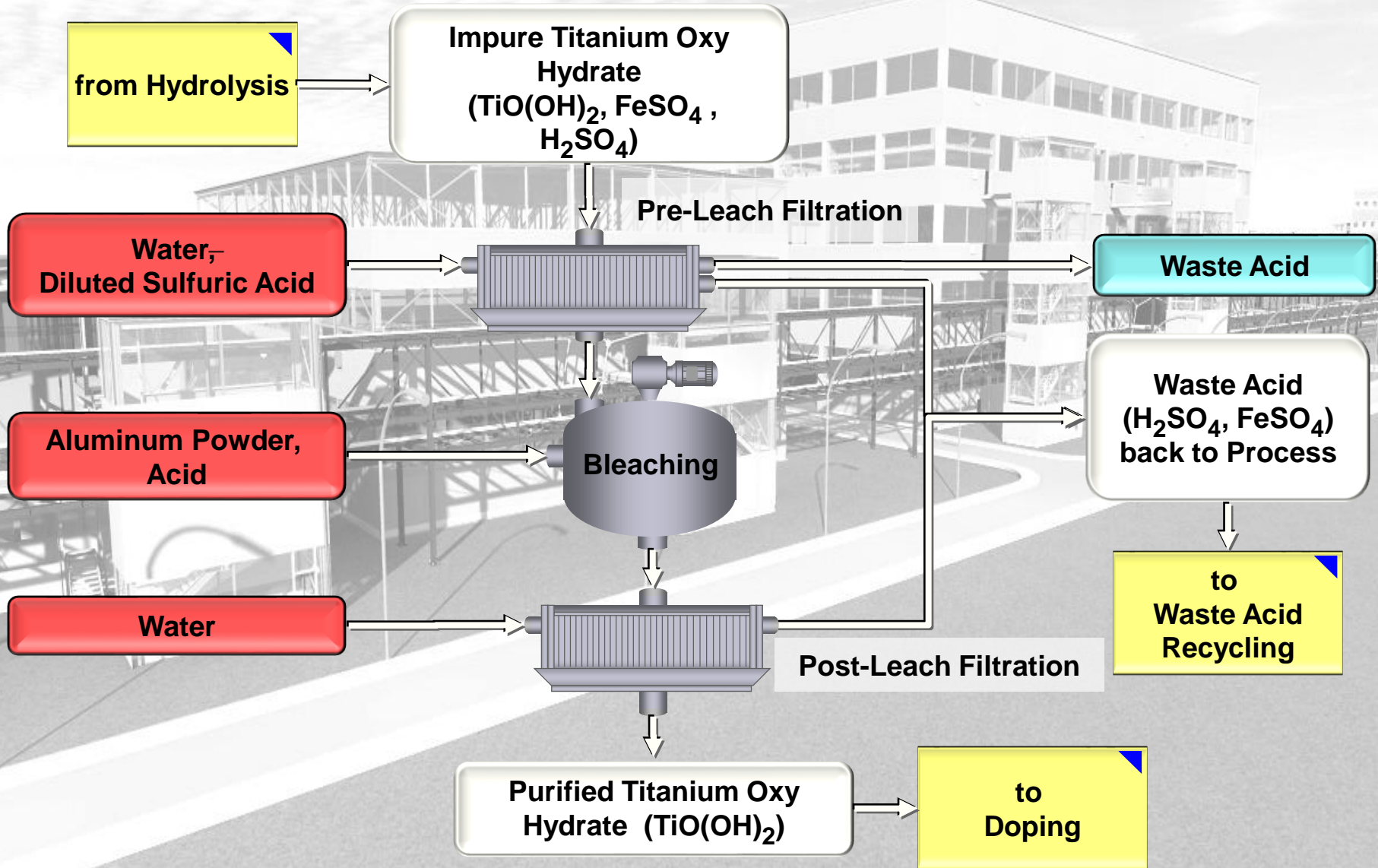
* If TiO₂ slag is used then crystallization isn't necessary

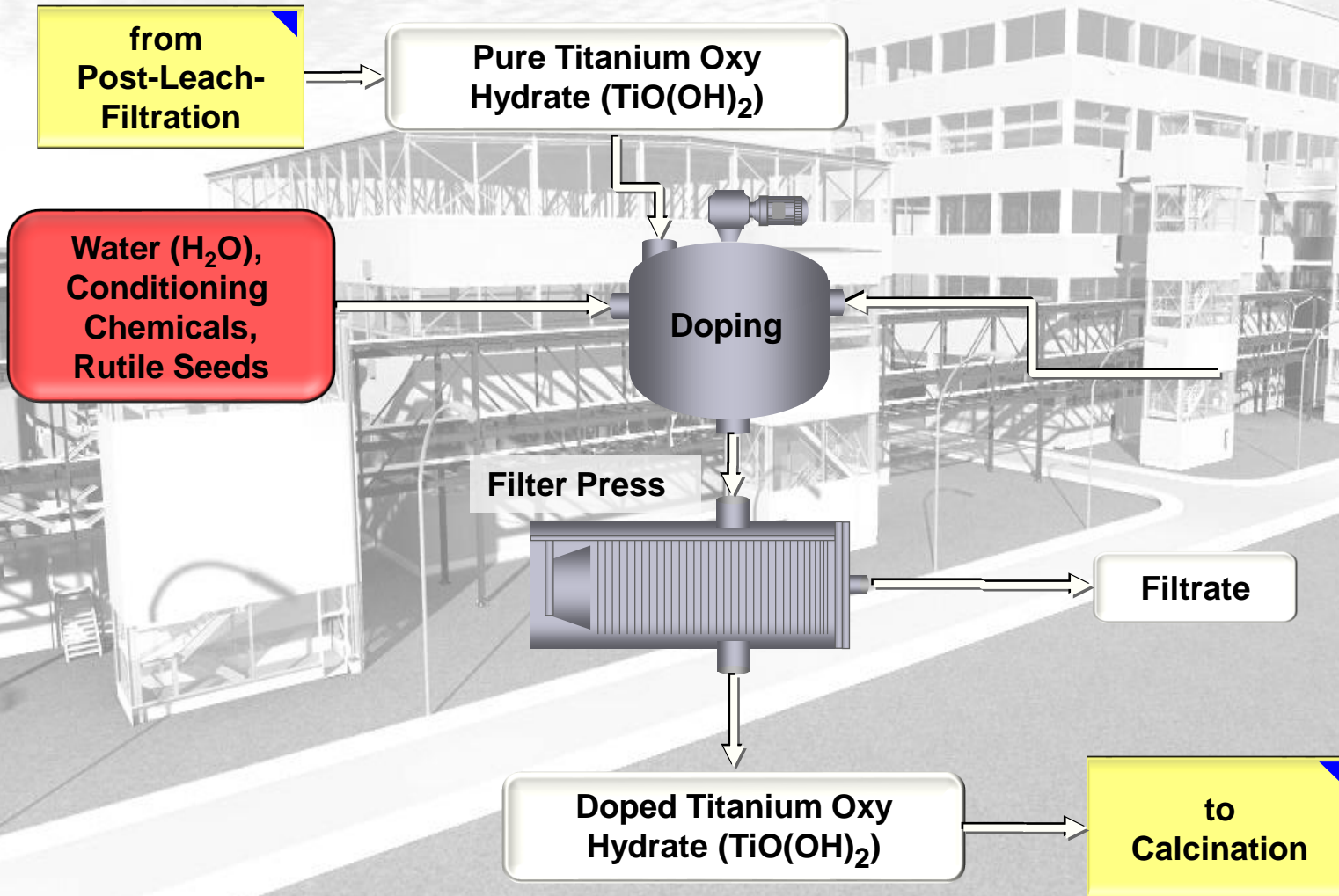


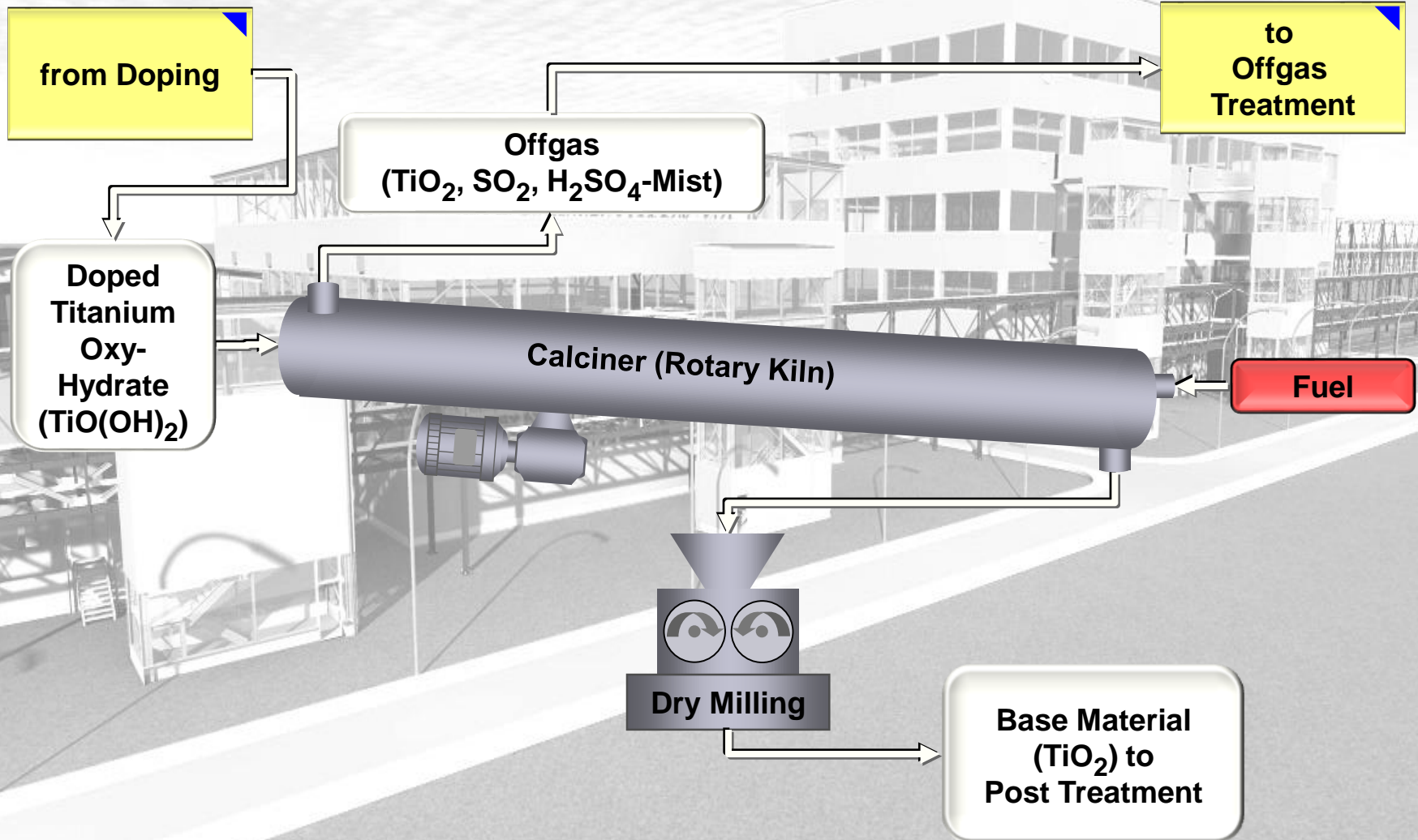
* If TiO₂ slag is used crystallization isn't necessary

Hydrolysis

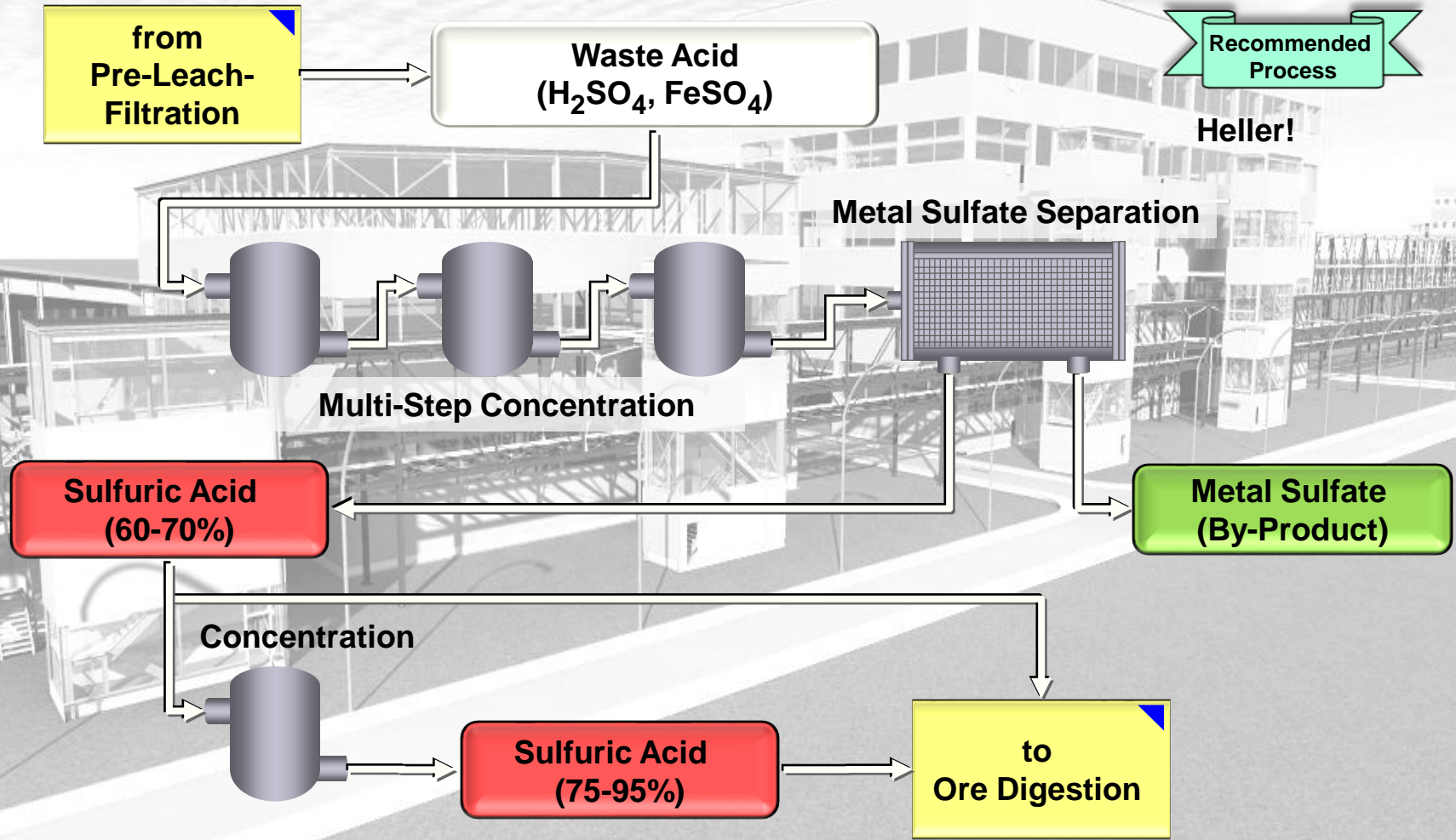




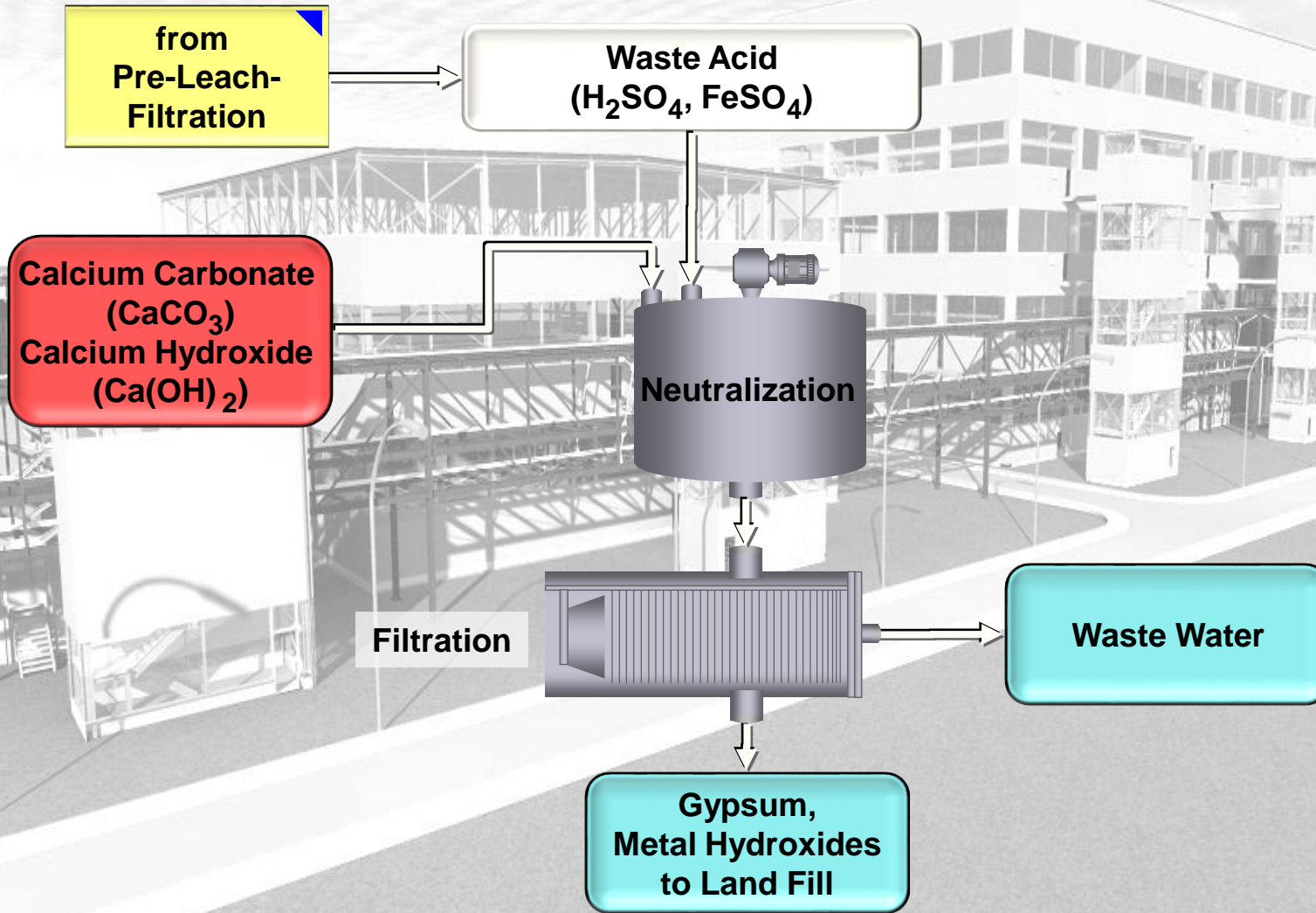




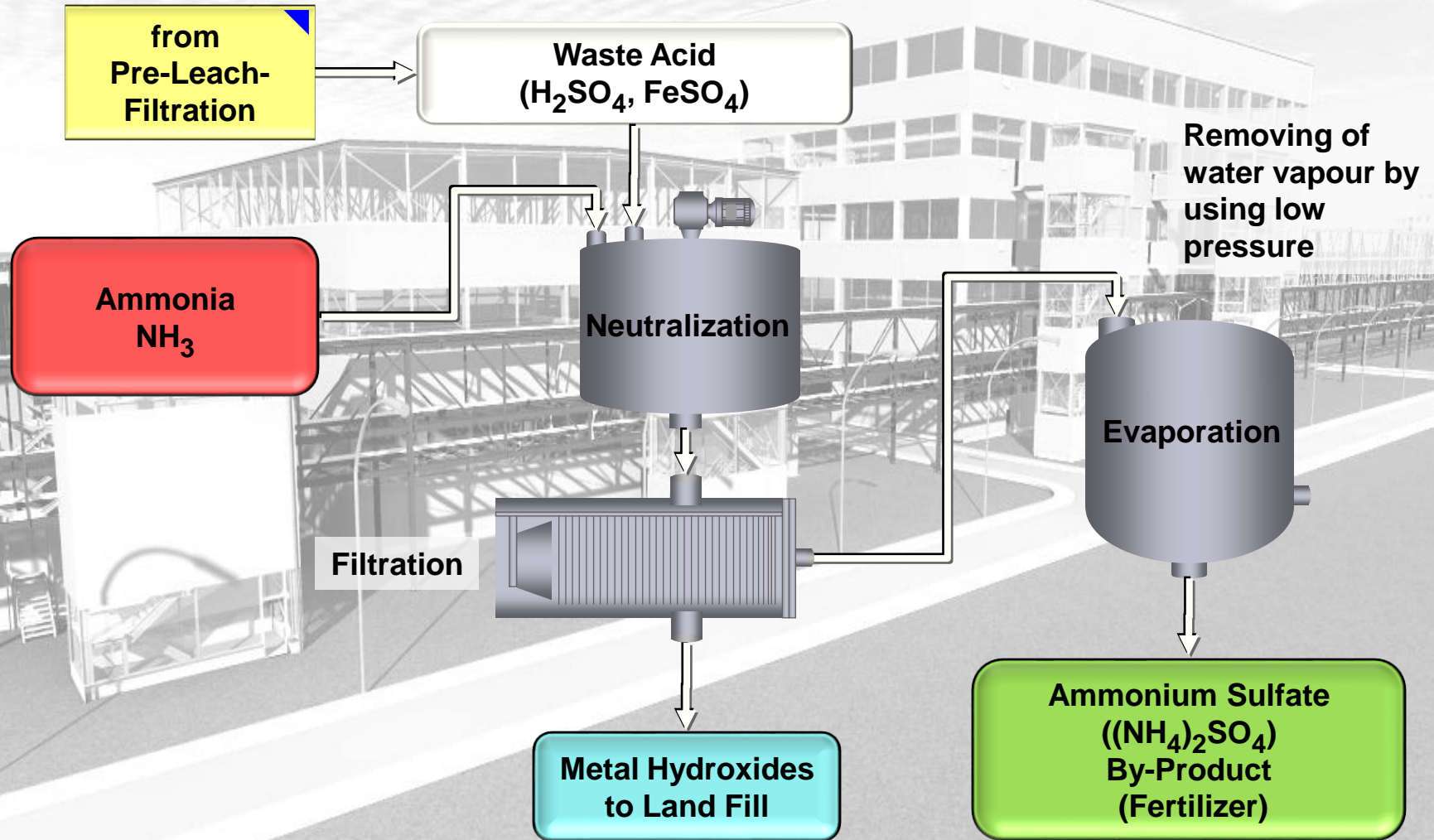
Waste Acid – Alternative 1 Sulfuric Acid Recycling

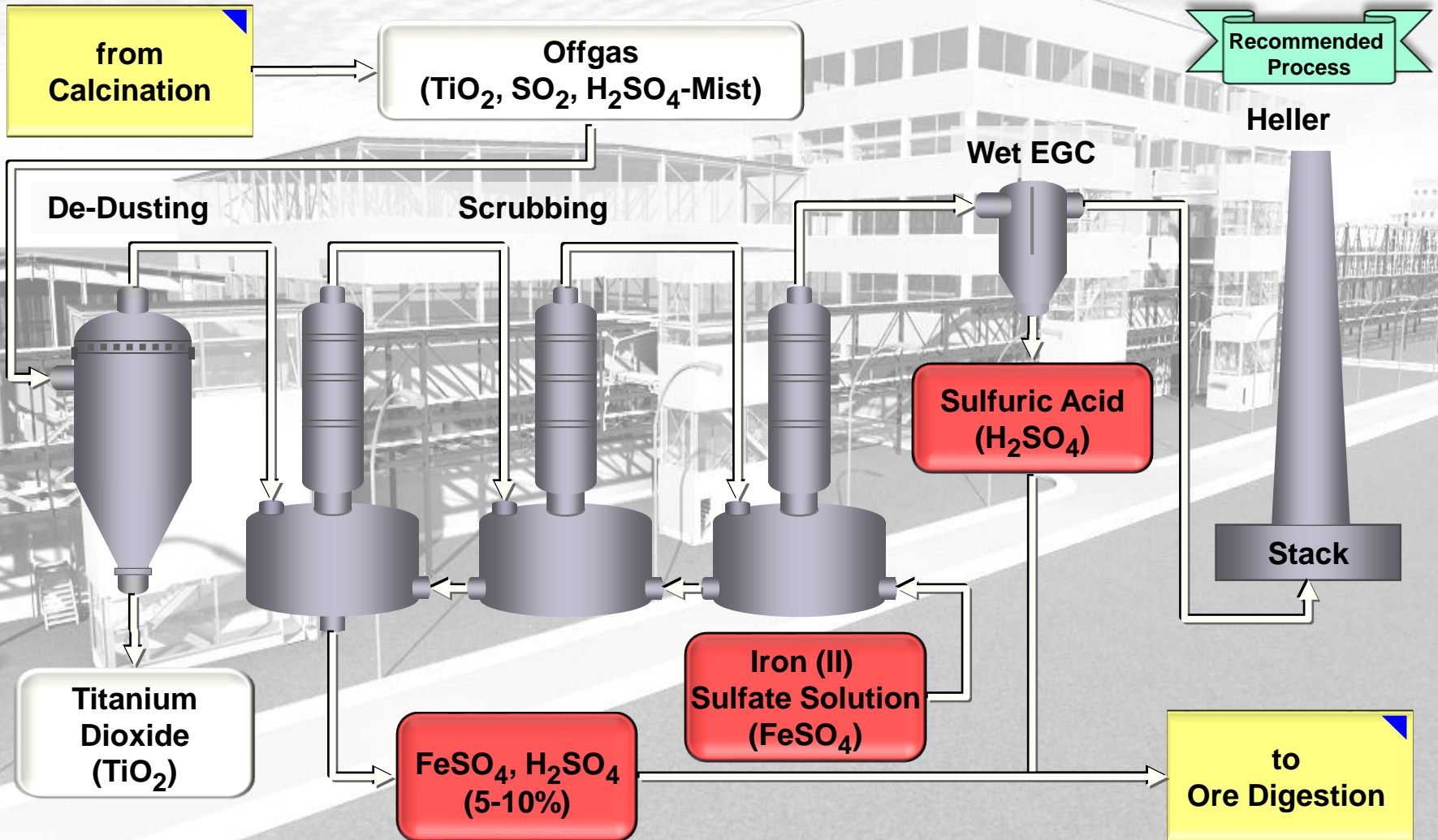


Waste Acid – Alternative 2 Neutralization #1

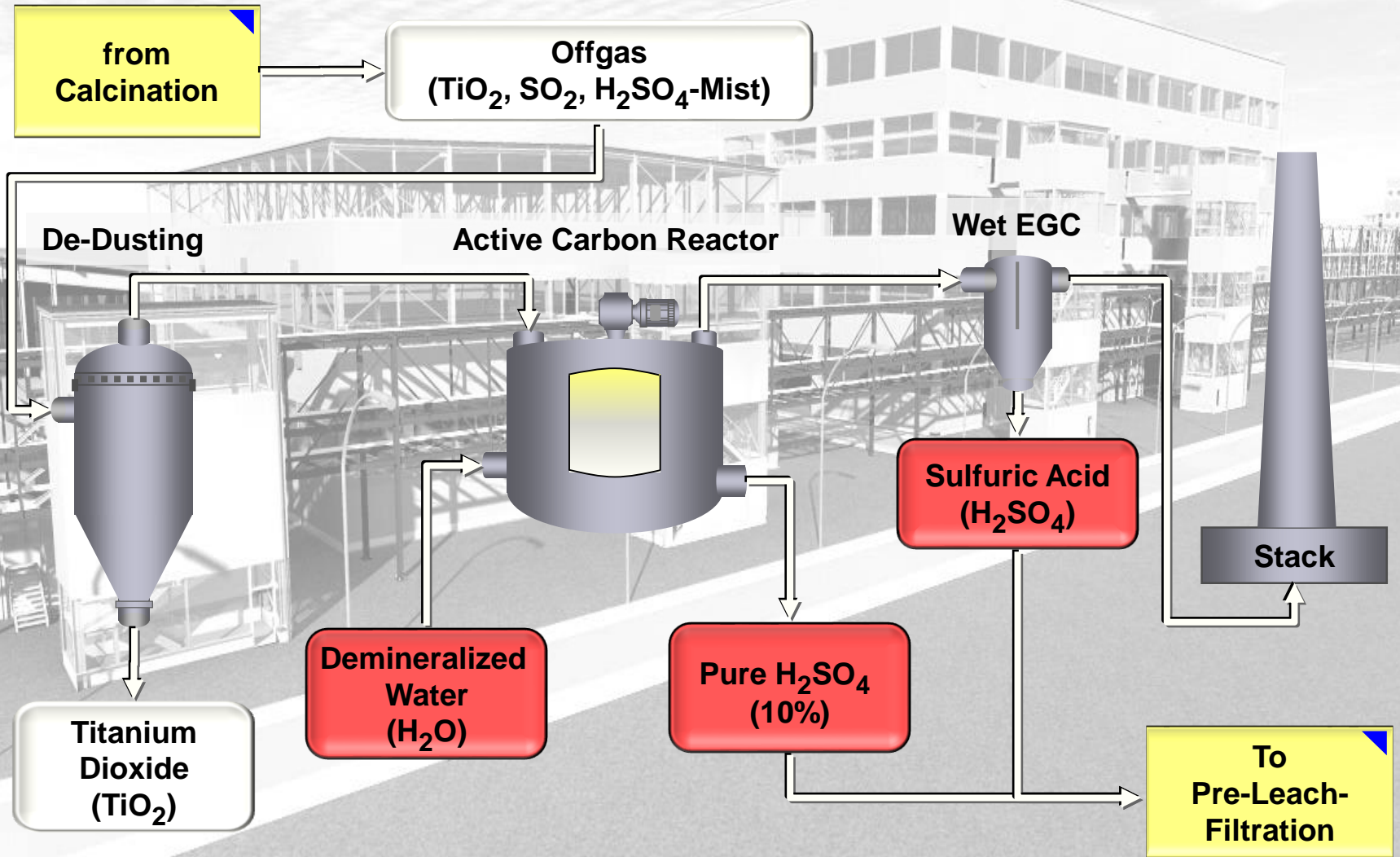


Waste Acid – Alternative 3 Neutralization #2





EGC = Electrical Gas Cleaning



EGC = Electrical Gas Cleaning

Advantages and Disadvantages of Sulfate Process compared to Chloride Process

Advantages



- Lower requirements to equipments and automation
- Use of low grade ilmenite is possible.
- The process is less sensitive to production short-fall because there is no closed loop.
- Lower requirements to the qualification of the staff
- In case oleum is not used then lower safety requirements

Disadvantages



- Larger buildings
- Lower product quality regarding optical and chemical properties
- In general, the production costs are higher, but it depends on the special circumstances
- More environmental impact due to more waste
- Process needs co-product management and attractive markets for co-products
- More man power necessary

Ilmenite/TiO₂ slag

- Insoluble TiO₂ residue should be below 1.5%
- Related to TiO₂ the content of Cr₂O₃ shall be below 0.2%
- Low contents of CaO, SiO₂, V₂O₅, Nb₂O₅, P₂O₅ are advantageous
- Low contents of radioactive elements are advantageous

Sulfuric acid:

- Technical quality is sufficient (concentration > 96%)