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SAIMM Sulphur & Sulphuric Acid 2025 27 MAY Stellenbosch Expanding The Capacity of Your Sulfuric Acid Plant

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To Deliver a Quality ProductThe TEAM Must

- Know all of the goals or targets
- Know the schedule of activities
- Know any constraints to meeting these two goals

One very good definition of “quality” is “meeting the mutually agreed upon requirements”.

These three statements should form a solid basis for establishing all of the requirements.



Increasing Capacity of Chemical Processes is Challenging

Especially true for the sulfuric acid process

While the main goal is almost always to increase the production capacity of the plant(s), there can be other goals:

- Air emissions management
- Replace equipment at or near end of life
- Reduce maintenance cost
- Increase energy recovery
- Increase the operating factor / efficiency of operation



Defining the Scope of the Expansion

- Production capacity
- Air emission limits
- Water emission limits
- HP and IP steam conditions
- Availability of all utilities
- Equipment targeted for replacement

The degree of engineering and third-party involvement will be based on the desired accuracy of the expansion study.

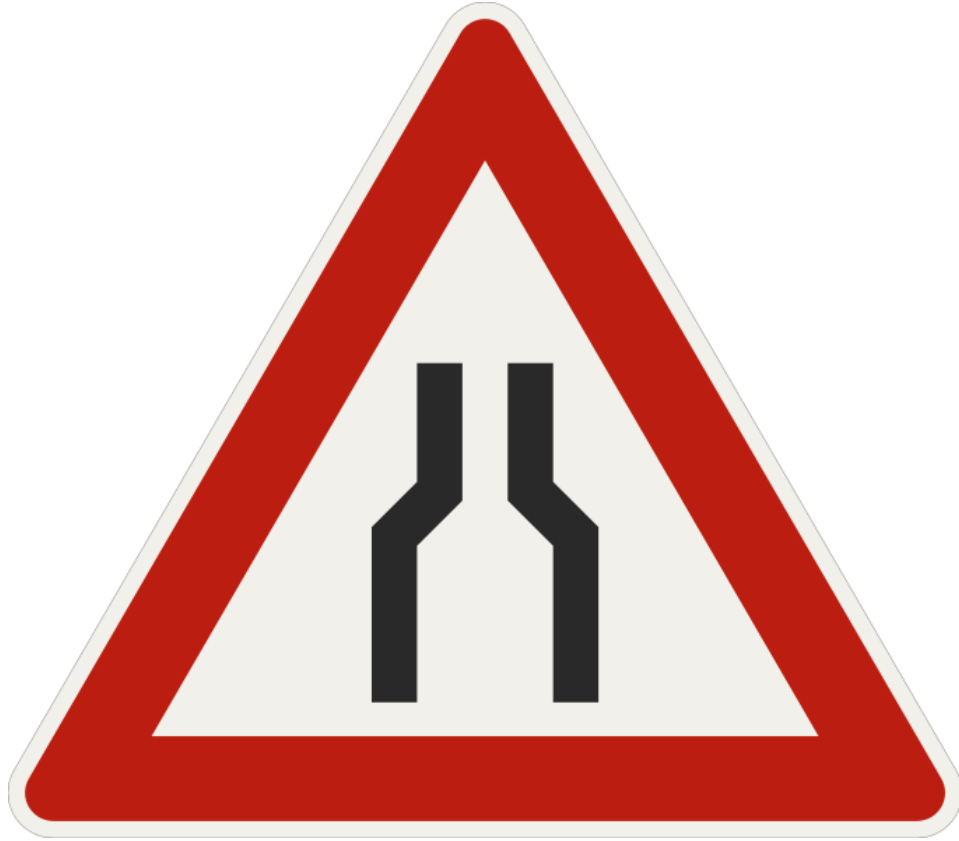


Major Steps for the Expansion Study

- Original design should be the starting point
- Data on any new or modified equipment
- Model current plant operation
- Develop a strategy to address bottlenecks
- Execute that strategy
- Validate results



Common Bottlenecks for the Expansion

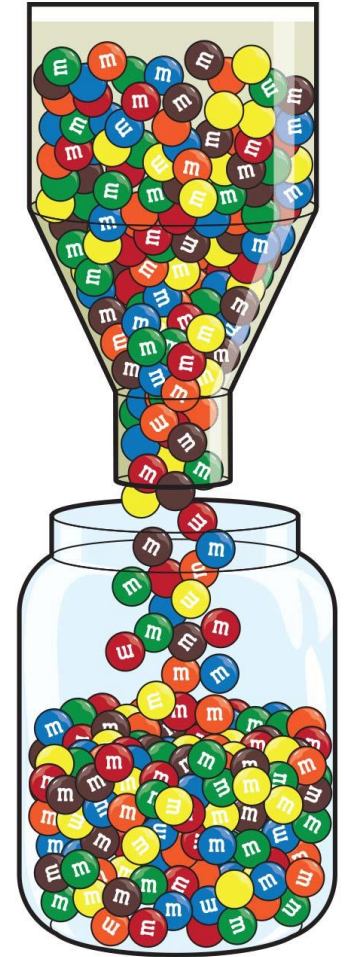
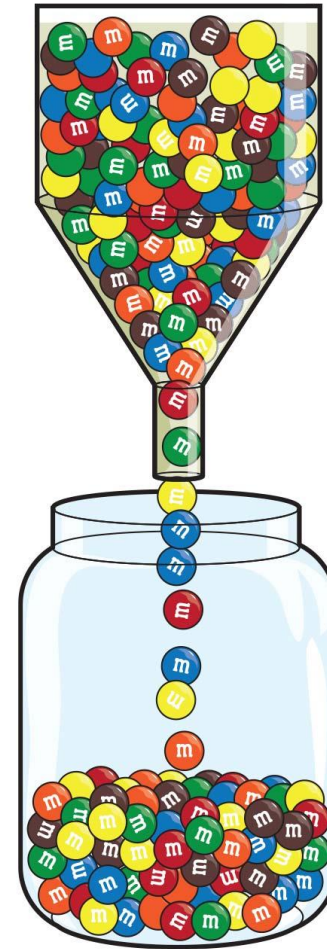


- Air/Gas flow
- Conversion/SO₂ emissions
- SO₃/acid mist emissions
- Managing the increase in gas energy
- Managing the increase in acid energy
- Managing the increase in all process flow streams



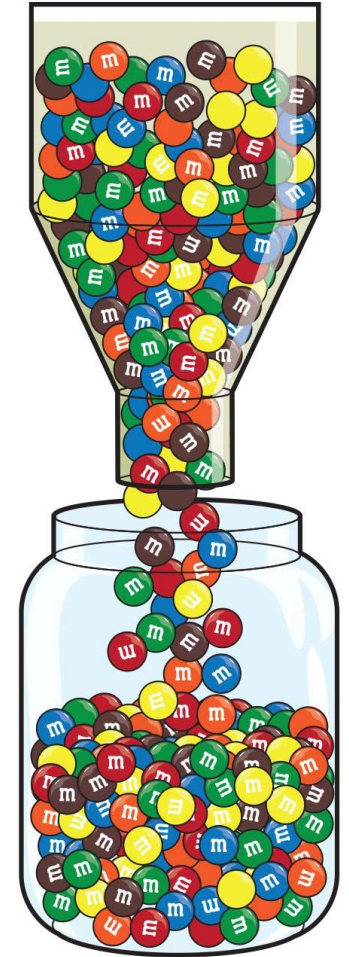
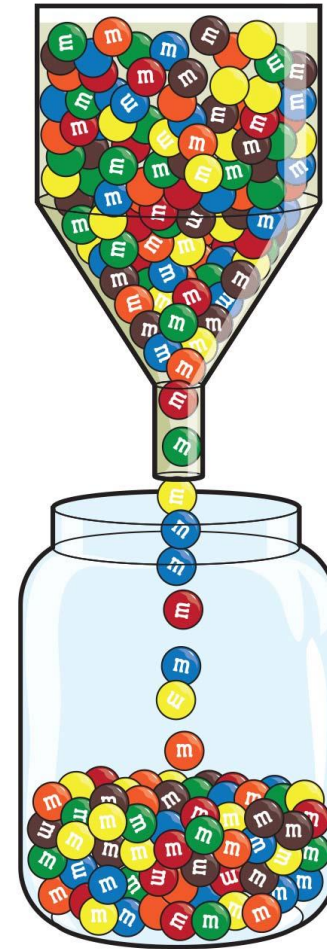
Common Methods to Address Bottlenecks

- Air/Gas flow – Blower rerate and optimization and/or supplemental blower
- Conversion/ SO_2 emissions – Increase catalyst loading and/or change the type of catalyst or bed location
- SO_3 /acid mist emissions – Increase the number of mist eliminators or change the type of mist eliminators



Common Methods to Address Bottlenecks (cont'd)

- Managing increased gas energy – HEX rerate and optimization and/or supplemental exchangers
- Managing increased acid energy – HEX rerate and optimization and/or supplemental exchangers
- Managing the increase in all process flow streams – Increase the impeller size or speed of pumps



CASE STUDY

20% Capacity Increase at
Pakistan Maroc Phosphore, S.A.



Air Blower Upgrade

CASE STUDY:
20% Capacity Increase at PMP



The existing air blower was upgraded with a larger impeller and the steam turbine drive was replaced to meet the duty.



Catalyst Replacement

CASE STUDY:
20% Capacity Increase at PMP

- Complete 1st bed catalyst replacement and additional 15% catalyst added in all beds
- 4th bed catalyst replaced with Cesium catalyst



Gas Heat Exchangers Rerated

CASE STUDY:
20% Capacity Increase at PMP

Existing waste heat boilers and economizers were rerated to handle the higher energy produced from the revamp.



Acid Cooler Addition

CASE STUDY:
20% Capacity Increase at PMP

Addition of
trim acid
cooler



Other Modifications

CASE STUDY: 20% Capacity Increase at PMP



- Modifications in steam, sea water and raw/polished water circuits to meet the increased duty due to the higher production
- Sulfur pump impellers replaced with larger ones
- Strong pump impellers replaced with larger ones



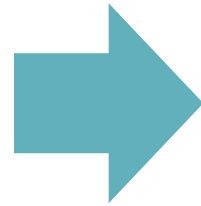
Results After All Modifications Completed

CASE STUDY:
20% Capacity Increase at PMP

PLANT CAPACITY INCREASED

**3,410
MTPD**

Original Design Capacity



**4,092
MTPD**

**120% of Original Design
Capacity**



Conclusions



Expanding the capacity of a Sulfuric Acid Plant
can be challenging, but...

when executed by a qualified Process
Technology Company the requirements can
be met to everyone's satisfaction.





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