

## CATALYST CASE STUDY NO. 02

# MECS® CATALYST PROVIDES THE ENGINE FOR THE LARGEST SULFUR BURNING ACID PLANT IN NORTH AMERICA

### Application

MECS® has been providing a variety of vanadium based catalysts to the sulfuric acid industry for over 85 years. The applications have been wide ranging and are often very challenging in terms of desired conversion rate and strict emission levels. MECS® high performance catalysts are designed for high SO<sub>2</sub> to SO<sub>3</sub> conversion levels and reduced SO<sub>2</sub> plant stack emissions. The tendency within the phosphate fertilizer/sulfuric acid industry over the last decade has been to build progressively larger plants with capacities approaching 5000 tons per day. Sulfuric acid plants this large generate new challenges with regards to gas distribution, SO<sub>3</sub> removal, and SO<sub>2</sub> emissions. This case study describes the successful use of a combination of two distinct MECS® high performance catalysts in a grass roots, large scale, new sulfur burning acid plant in North America.

### OPERATING CONDITIONS/REQUIREMENTS

ACID PRODUCTION	4500 STPD (4082 MTPD)
PLANT DESIGN	3 X 1 IPA WITH MECS HRS SYSTEM
FEED GAS	11.50% SO <sub>2</sub> & 9.46% O <sub>2</sub>
EFFECTIVE CONVERTER DIA.	54 FT. (17.4 M)
GUARANTEED CONVERSION	99.85 %
EXIT GAS EMISSIONS	< 200 PPM SO <sub>2</sub> (< 2 LBS.SO <sub>2</sub> /STPD)

PCS Phosphate Company, Inc. is an indirect, wholly owned subsidiary of Potash Corporation of Saskatchewan, Inc., the world's largest fertilizer company by capacity, and it owns and operates the Aurora, North Carolina facility, *PotashCorp-Aurora*. This facility is now the world's largest vertically integrated phosphate enterprise. It earned this distinction with the start-up and demonstration of the PCS No. 7 plant in early 2010. This acid plant was designed by MECS®, Inc. in collaboration with Abener LLC of St. Louis, MO. A summary of the design conditions and requirements for the No. 7 plant are listed in the table above.



PCS PHOSPHATE COMPANY, INC.  
PLANT No. 7, Aurora, NC, U.S.A.

### MECS® Super Cesium SCX-2000 Catalyst Advantages:

- Higher plant production rates from Cesium enhanced support formulation
- Lower ignition temperatures result in faster start ups and higher conversion
- Lower acid plant stack emissions



### MECS® XLP Catalyst Advantages:

- 6 lobed ribbed ring for lower pressure drop
- Improved catalytic activity from the extended surface area design
- Enhanced durability for better dust control and lower screening losses



**MECS®**  
CATALYST®

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## MECS® converter loading design

The PCS No. 7 plant converter was designed to accommodate the use of the MECS® XLP series of low pressure drop catalyst to generate maximum conversion with minimal pressure drop. In order to achieve the required conversion through the fourth catalyst bed, an inlet temperature of less than or equal to 750°F (400°C) was required to avoid equilibrium limitations and to allow for greater heat recovery. This requirement was achieved through the use of the MECS® Super Cesium SCX-2000 catalyst in the final bed. Therefore, by utilizing a combination of XLP and SCX-2000 catalysts, the high conversion rate and low pressure drop requirement guarantees were easily attained.

## PCS No. 7 Plant Demonstration Results

The performance of the No. 7 plant at the PCS Phosphate-Aurora site was demonstrated in mid-March 2010 and the following results were obtained.

At 105% of design capacity, the measured emissions were only 75% of the maximum allowable level, indicating good performance of the MECS® catalyst and the overall sulfuric acid plant. In addition, the low and high pressure steam generation also exceeded the design levels. It

should be noted that the demonstrated SO<sub>2</sub> emission rate reflects operation using fresh XLP and SCX-2000 MECS® Catalysts. It is expected that over time the SO<sub>2</sub> emissions will be closer to the design value of 2.0 lbs./STPD as the catalyst normally ages. The performance of the PCS No. 7 plant is an excellent example of the superior catalytic properties of MECS® Catalysts. The complete line of MECS® Catalyst continues to demonstrate excellent performance in hundreds of sulfuric acid plants throughout the world.

### NO. 7 PLANT PERFORMANCE RESULTS

	DESIGN	DEMONSTRATED
PLANT CAPACITY:	4500 STPD	4722 STPD
PASS 4 INLET TEMPERATURE:	752°F (400°C)	756°F (402°C)
SO <sub>2</sub> EMISSIONS:	2.00 lbs./STPD	1.45 lbs./STPD



[www.mecs.dupont.com](http://www.mecs.dupont.com)

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