Case No. 1101: Reducing CO and VOC’s from PTA Plants
With Johnson Matthey SC29 PTA Catalyst

Until recently, oxidation catalysts used to reduce VOC emissions from PTA plants contained high amounts of precious metals such as platinum and palladium (PGM) making these catalysts fairly expensive. After an extensive R&D effort by Johnson Matthey's catalyst scientists, a new catalyst was developed that does not contain precious metals. This new SC29 PTA catalyst has maintained the same performance as the traditional PGM based catalyst, but has significantly reduced the cost.

PTA (Purified Terephthalic Acid) Uses

Nearly all purified terephthalic acid (PTA) is consumed in the manufacture of polyester including polyester fiber, polyethylene terephthalate (PET) bottle resin and polyester film.

PTA Process Emissions and PTA Catalyst

PTA plants emit carbon monoxide (CO) and a variety of volatile organic compounds (VOC’s), including methyl bromide, methyl acetate, xylene, acetic acid and methanol. VOC’s contribute to the formation of ground level ozone or smog when it reacts in the atmosphere with nitrogen oxides (NOx) and UV light. Methyl bromide is additionally a stratospheric ozone depleter.

PTA manufacturers have used oxidation catalyst since the mid 1990's to reduce these emissions, making oxidation catalyst a standard practice in the PTA industry. Until recently, the standard oxidation catalyst contained precious metals such as platinum and palladium.

New Lower Cost Non-Precious Metal PTA Catalyst from Johnson Matthey

Johnson Matthey was approached by a PTA customer whose standard PTA catalyst was deactivating requiring them to increase their operating temperature in order to meet the VOC conversion rate. A typical new PTA catalyst operates at 280°C. As the catalyst deactivates, the operating temperature is gradually increased to accommodate, such that after 5 to 6 years, the catalyst outlet temperature reaches 375°C. Since PTA manufacturing plants have a very high volume of exhaust gas, the cost associated with operating at elevated exhaust temperatures is significant.

Johnson Matthey’s SC29 PTA catalyst was introduced to the customer offering the following benefits over standard catalyst:

- **Reduced Operating Cost** – The operating cost was reduced by reducing the operating temperature from 375°C to 280°C
- **No Precious Metals** – The SC29 PTA catalyst does not contain precious metals and the catalyst it replaced did have precious metals, which made the replacement very cost effective. In order to illustrate the cost effectiveness we compared the sell price of the SC-29 catalyst versus the value of the precious metals in the last two generations of Johnson Matthey PTA catalyst.
- **Reduced Cost of Ownership** – The sale price of SC-29 + site costs for catalyst removal and
installation of new catalyst is approximately $300K. The reclaim value for same volume of SC-24 catalyst (basis: Pt @ $1831/to, Pd @ $812/to) is $322K. The Approximate reclaim value for the same volume of 1-LMB catalyst (basis: Pt @ $1831/to, Pd @ $812/to) is $565K.

- **Net Gain** – The comparisons above show that the plant will make money by removing and refining the old PGM based catalyst and replacing it with the non-PGM SC29 catalyst. The exact amount of the savings will be determined by the level of precious metals that are in the catalyst being replaced.

The customer decided to replace the deactivated catalyst with the new SC29 catalyst. It has been running since November, 2009 and upon startup worked flawlessly at the designed operating temperature. After 16 months of operation, the SC29 catalyst is still performing like new, and the customer recently ordered catalyst for a second reactor.

**Conclusion**

This catalyst is a technological breakthrough for the PTA industry. PTA plants can now replace their existing PGM based catalyst with a non-PGM catalyst and the savings from reclaiming the PGM catalyst will more than pay for the cost of the replacement SC29 catalyst. In addition, the catalyst replacement will reduce plant operating costs by reducing the operating temperature.

New PTA plants that utilize the SC29 catalyst will have a definite advantage over plants that use a PGM based catalyst because it will dramatically decrease the capital cost associated with building a new plant.