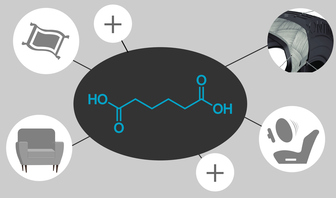
REDUCING GHG EMISSIONS IN ADIPIC ACID PRODUCTION IN CHINA

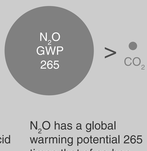
CLIMATE ACTION RESERVE

WHY ADDRESS ADIPIC ACID PRODUCTION EMISSIONS IN CHINA



Adipic acid is primarily used in the manufacture of nylon 6,6 -polyamide, which has wide usage in everyday products including carpets, tire cord, safety air bags, apparel, upholstery, auto parts, and hundreds of other applications.

Nitrous oxide (N_2O) is an unavoidable byproduct of adipic acid production. For every molecule of adipic acid produced, a molecule of N_2O is produced as a byproduct.



N_2O has a global warming potential 265 times that of carbon dioxide (CO_2).

3 MILLION

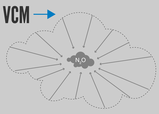
In 2015, annual global production of adipic acid was estimated at over 3 million metric tons, with China and the U.S. representing the two largest sources of global production.

Due to global demand, adipic acid production in China is projected to grow at 5.5 percent/year, faster than any other nation.

The Reserve adopted an Adipic Acid Production Protocol for the U.S. in 2020 and is applying its experience and insights to support GHG reductions in adipic acid production in China.

Installing N_2O abatement technology is an important step in reducing global emissions, with the potential to reduce 100% of N_2O emissions compared to the baseline.

But N_2O abatement is expensive to undertake and without incentives to do so, facilities are not voluntarily investing in such abatement. Both new installation and enhancement projects face financial barriers, with new investment costs estimated from $10.6 - $17.25 million and increased operating costs estimated from $1.33 - $2.0 million per year.



Incentivizing abatement through the voluntary carbon market could help curtail current N_2O emissions and prevent exponential growth in a region with few existing incentives and no anticipated regulatory requirements to abate.

HOW THE CHINA ADIPIC ACID PRODUCTION PROTOCOL SUPPORTS GHG REDUCTIONS

The China Adipic Acid Production Protocol issues carbon credits for N_2O emission reductions associated with:

The installation and operation of a new, previously uninstalled N_2O abatement technology

AND/OR

The enhancement of an existing control technology; requires upfront capital expenditure to improve N_2O abatement efficiency compared to historical levels

Approved N_2O abatement technologies include:

Catalytic Destruction: Destroy N_2O using a catalyst – selective or non-selective catalytic reduction

Thermal Destruction: Destroy N_2O using flame burners with pre-mixed methane or natural gas

Recycle to Nitric Acid: Recycle N_2O to create nitric acid by burning the gas at high temperatures with steam

Recycling / Utilization Technologies: Utilize N_2O as a reactant or input to produce other products

Another control technology that avoids N_2O emissions from the production of adipic acid, pending Reserve approval

The protocol includes key eligibility constraints to ensure additionality:

Legal requirement test: there are no laws, regulations, or other legally binding mandates requiring the installation of N_2O abatement technology

Projects are not currently required to abate N_2O emissions under a national or regional emissions trading scheme in China

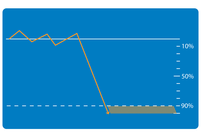
Regulatory compliance: Project activities must not cause material violations of applicable laws (e.g., air, water quality, safety, etc.)

China's Emissions Trading Scheme and China's Certified Emissions Reduction Scheme currently don't cover N_2O. If programs expand to include N_2O at a later date, the Reserve will review their impact on project eligibility. A regional ETS program in Chongqing regulates total CO_2e and since N_2O abatement is one way of meeting the requirements, only N_2O abatement in excess of program compliance requirements are eligible for crediting.

The protocol features rigorous standards for real GHG reductions and avoidance of perverse incentives

Under the CDM, it was possible that the value of certified emission reductions (CERs) created through N_2O abatement exceeded the value of the adipic acid itself, creating perverse incentives to increase adipic acid production.

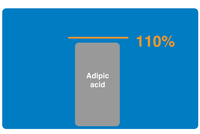
Two facilities in China increased production of adipic acid for the purpose of destroying N_2O for carbon credits and certified over 1 billion CERs between 2008 and 2013.



90% baseline abatement efficiency

This protocol utilizes a mandatory minimum 90% abatement efficiency to ensure rigorous GHG accounting. By only crediting for N_2O abatement above 90%, the economic incentives remain attractive but will not create the same skewed incentives as under the CDM.

0-90% previous abatement	=	90% baseline abatement efficiency
>90% previous abatement	=	baseline is the maximum abatement (>90%) over a 5-year lookback period



Production cap on credit issuance based on an adipic acid plant's nameplate capacity

The protocol aims to avoid potential production increases for the purpose of creating credits. If production increases above the nameplate capacity and if intending to receive credit for the increased production levels:

- Must notify the Reserve for up to 10% increase in production capacity
- If over 10%, adipic acid plants must demonstrate market demand to show the increase is not solely for the purpose of generating additional credits. For example, provide documentation (e.g., invoices, contracts) that the additional adipic acid produced above the 110% level has been sold into the market.

Demonstrate verifiable, real reductions with ongoing monitoring requirements

- Daily monitoring to ensure quality hourly data recorded by continuous emissions monitoring systems (CEMS)
- Weekly inspections of CEMS components
- Monthly monitoring system inspections of N_2O CEMS and flow velocity of continuous monitoring systems
- Quarterly CEMS total system calibration assessments
- Semiannual CEMS accuracy assessments