

## CLEANING OF UREA STRIPPERS

The substance urea is employed for, among other purposes, artificial fertilizer and raw material for the plastics industry. Urea is synthesized from carbon dioxide ( $\text{CO}_2$ ) and ammonia ( $\text{NH}_3$ ). This chemical reaction does not provide immediately a 100% yield. In order to complete the reaction a so-called "urea stripper" is employed. Urea strippers are manufactured from stainless steel alloy and consist of vertical tubes with the reaction progressing on the interior of the tubes while steam is introduced on the exterior of the tubes. After a period of time a deposit develops in the urea stripper.

A typical deposit in a urea stripper consists of ferric oxide (hematite) with admixtures of nickel, chromium and molybdenum oxides and is generally grey to black in colour. This deposit causes reduced heat transfer resulting in a reduction of production process efficiency.



Urea stripper in Romania

Iron oxide deposits can generally be removed readily from a stainless steel surface by acid pickling. This however also results in a very small portion of the base material being dissolved. This in turn increases the roughness of the stainless steel surface. This so-called acid corrosion can be slowed down by addition of inhibitors (pickling inhibitors), but this in itself will be insufficient to protect the stripper completely from material loss. It is not acceptable for part of the base material to be exposed to any corrosion.

Research into an alternative cleaning method for the removal of the iron oxides involving the possibility of minimum corrosion were carried out in collaboration with DSM and Stamicarbon.

A cleaning solution based on EDTA appears to dissolve this deposit completely at high temperature without corroding the base material. In a pH neutral medium the iron oxide will dissolve forming an iron -EDTA complex.

The cleaning temperature is selected to maximize the reaction of the EDTA with the iron oxides. During cleaning the free EDTA and dissolved iron levels are continuously

monitored in order to provide insight into the progress of the cleaning process. Prior to cleaning the total quantity of EDTA and the number of batch treatments required are determined on the basis of the quantity of deposit and the size of the Stripper. Cleaning is carried out in batches employing a "Fill & Soak" method, in which nitrogen gas is used as agitation agent. Pump circulation is not possible due to the high temperature at which cleaning is conducted.

Vecom Industrial Services specializes in, among other activities, the chemical cleaning of urea strippers and has during the past 23 years cleaned successfully many urea production installations.

You will see on the 2<sup>nd</sup> page a graph depicting the progress of a Urea Stripper cleaning session and a reference list of urea cleaning operations carried out.



Upper surface of a urea stripper in Iran

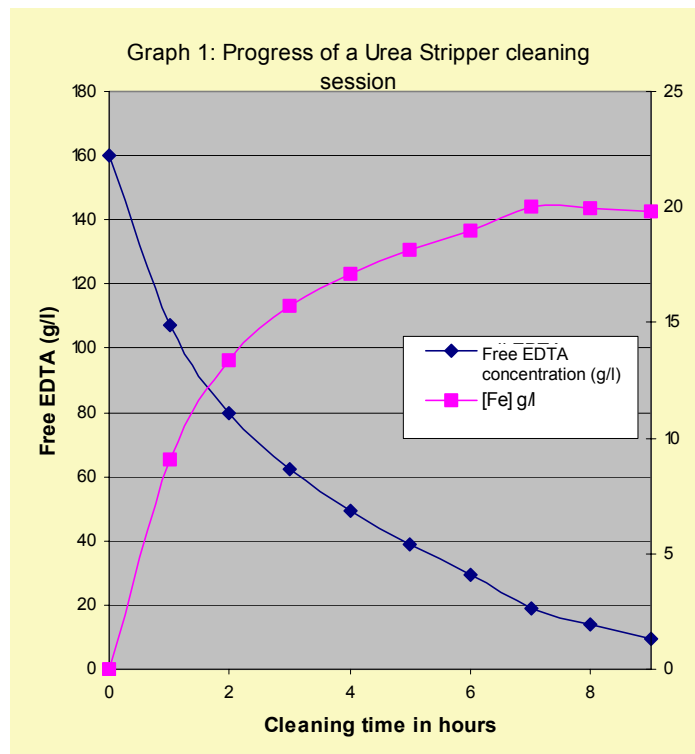


Table: Reference list of urea stripper cleaning operations

Company	Place, Country	Year
Sofert SA	Bacau, Romania	2004
Razi Petrochemical Comp.	Bandar Emam Khomeini, Iran	2004
Fertilizantes Quimicos SA	Mexico	1996
Mangalore Chemicals & Fertilizers Ltd	Panambur Mangalore, India	1996
Grande Paroisse SA	Oissel, Frankrijk	1992
Zia Fertilizer Comp. Ltd.	Ashhuganj Brahmanbaria, Bangladesh	1991
DSM	Geleen, Nederland	1981 & 1990
Irish Fertilizer Industries	Cobh – Co Cork, Ierland	1987

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