

Clean ... Cleaner ... Oxygen clean!

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Introduction

Certain applications in f.i. the petro-chemical industry, require extremely clean surfaces. Cleaning these surfaces is summarised in the name: ultra-clean or cleaned for oxygen use. Systems for pure oxygen applications for example, require complete absence of organic contamination such as oil, grease, finger prints. Even the smallest traces of contamination could lead to spontaneous combustion (read explosion), especially during higher temperatures.

Cleaning procedure

The cleaning of pipes, heat exchangers, air coolers, filters and similar devices for pure oxygen applications require a high level of purity of the cleaning products and the rinsing water.

Vecom has many years of experience with cleaning for pure oxygen application of various metals. In practise, this mostly includes stainless steel, carbon steel, aluminium and chromium or copper alloys. The cleaning takes place, dependent on the types of metal used and the contamination that must be removed, in one or more steps. The cleaning agents used are alkaline, neutral or acid chemical substances. The metal surface treatment normally only comprises the degreasing, but it could include treatments such as pickling, passivation, phosphating.

Different techniques are used based on what must be cleaned, the contamination and the measurements. Ultrasonic cleaning, where ultrasonic waves loosen the dirt (especially grease and soot) through vibrations, is preferred. Ultrasonic cleaning is especially suitable for constructions with relatively small distances between parts, for example air-coolers and filters.



Piping is normally cleaned with immersion or circulation techniques. Circulation is also used frequently for oxygen-clean cleaning on site. Alternatively brushes, or in case of very large areas, sprayers can be used.

Final inspection

Apart from the cleaning procedure, the final inspection of treated material is also of essential importance. The final inspection can take place with a UV light, a wipe test or an evaporation test with chemically pure solvents to guarantee the removal of all organic contamination.



Wipe test

This method can be used to establish the cleanliness of surfaces that are not accessible for visual or UV inspection. The surface is wiped down with a clean fibreless white cloth or filter paper, moistened (but not soaked) with pure tetrachlorethylene. A wipe test on pipes with a small diameter is performed by shooting plugs through it. A clean, white plug, slightly bigger than the internal diameter is blown through the pipe with clean, dry air.

The absence of dirt on the cloth/filter paper/plug is proof of the cleanliness of the surface.

Evaporation test (according to ASTM norm G93-03)

This method can also be used to establish the cleanliness of surfaces that are not accessible for visual or UV inspection. The benefit of the evaporation test with regard to the wipe test is that it is possible to determine exactly how much organic material is present on the surface. This is reflected in mg/m^2 . Approximately one square metre surface is washed with approximately 1 litre pure tetrachlorethylene. The solvent is collected in a glass cup. 100 ml of the solvent is poured into a 200 ml glass cup with a bar of magnesium oxide, then evaporated and dried at 105 °C until the weight is constant. The balance of the evaporation must be less than 100 mg/l. If the balance is higher than 100 mg/l, the magnesium oxide bar must be held in a flame for approximately 5 seconds. The bar must be inflammable.

Normally, 100 mg/m^2 is retained for oxygen clean cleanings, but lower values up to 10 mg/m^2 could also be established. Our laboratory issues a final inspection certificate for every cleaning for pure oxygen or ultra-clean application.

Packaging

After cleaning and inspection, treated parts are carefully packed according to special procedures. This way, the treated material is not contaminated during transport and handling. Standard specifications are, for example the Class AA (former A03) norm of Air Products, Standard D.I. CS274.01d Air Liquid norm and Linde Class 2 (oxygen) cleaning revised issue 1981 norm.



Vecom has all the required techniques and resources to comply with the specifications of all internationally renowned companies.

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