Essential Information

Introduction

This directory was developed to provide important information and comparable data to assist in the selection of precision cleaning agents that may be suitable for oxygen service. **The inclusion of any product in this directory is not an endorsement, recommendation, or approval by the Compressed Gas Association of the product for use in any application.**

Comparative Parameters

The directory provides comparative information for both aqueous and solvent cleaners, as provided by the manufacturers, on items such as evaporation rates, corrosivity, pH, residue potential, flammability, health hazards, Threshold Limit Value (TLV) and Permissive Exposure Limit (PEL) factors, ozone depletion rating, EPA Clean Air Act, RCRA Hazardous Waste, and SNAP List Material Compatibility.

Cleaning Efficiency Factor (CEF)

The CEF was determined by testing each cleaning agent at an independent laboratory using ASTM protocols; ASTM G-121, *Practices for Preparation of Contaminated Test Coupons for the Evaluation of Cleaning Agents for Use In Oxygen-Enriched Systems and Components*, and ASTM G-122, *Standard Test Method to Evaluate the Effectiveness of Cleaning Agents.*

Standard Tests

The procedures for the standard CEF test for aqueous cleaners require a concentration of 5 percent at 150 °F immersed for 10 minutes without agitation. Solvents are tested by immersion for 2 minutes at room temperature without agitation. The manufacturers' recommendations for actual use may vary significantly from this procedure. It is important to understand that the CEF number is a cleaning efficiency factor based only on set parameters for the standard test procedure.

Nonstandard Tests

In addition to the standard test, the opportunity to request a nonstandard test was available to the cleaning agent suppliers to allow the use of alternative procedures and parameters involving concentration, temperature, time, and agitation. Such tests are so identified.

References

Precision cleaning for oxygen service requires many considerations. If you are cleaning equipment for oxygen service, you should be familiar with the following publications:

- CGA G-4.1, *Cleaning Equipment for Oxygen Service*, which is available from the Compressed Gas Association at (703) 412-0900, extension 799,
- ASTM G-127-95, *Standard Guide For the Selection of Cleaning Agents for Oxygen Systems,* and
- ASTM G-93-96, *Standard Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments*, which are available from the American Society for Testing Materials at (610) 832-9585.

Continued on the next page

Published by:

Compressed Gas Association, Inc.

1725 Jefferson Davis Hwy., Suite 1004
Arlington, VA 22202
Phone: (703) 412-0900
FAX: (703) 412-0128
E-mail: cga@cganet.com
Web Site: www.cganet.com

Standard CEF Test Procedures

Testing of Cleaning Agents per ASTM G-121 and ASTM G-122

Test Coupons:	Six per test (five plus one control): Coupons are 304 stainless steel in accordance with ASTM G-121, except mill finished instead of glass bead blasted. Coupons shall be used a maximum of 20 tests. Coupons shall be cleaned between tests. 1,1,1-trichloroethane or methylene chloride are acceptable cleaning fluids.
Contaminant:	Hydrocarbon oil (Mobil 600)
Contaminant Level:	1615±538 mg/m² applied to one side of the coupon with swabs and/or wipes.
Temperature:	Solvent based = 75±5 °F (23.9±2.8 °C) ; Aqueous based = 150±5 °F (65.6±2.8 °C)
Immersion:	Coupons immersed in individual beakers 500 ml each. To avoid any possibility of cross-contamination, especially with the control coupon, separate 500 ml beakers should be used with each coupon.
Immersion Time:	Solvent based = 2 minutes; Aqueous based = 10 minutes
Rinse:	Solvent based, no rinse. Aqueous based, 5 minute "soak" with ASTM Type II water by immersing in a beaker (no flow).
Dry:	Hang dry

Introduction continued from the previous page

Solvent Evaporation Rate

Each solvent manufacturer has provided a comparative evaporation rate (Butyl Acetate=1.0) if known. The ability of a solvent to evaporate quickly is extremely important in cleaning applications.

Residual Solvents/Cleaners

A cleaning agent remaining in an oxygen system is a severe hazard. It is essential that residual cleaning agent (in hidden areas, crevices, or porous surfaces) **be completely removed.** This factor has equal importance to the CEF.

Selection of Cleaning Agent

The type of cleaning application involved is an important element in selecting the best cleaning agent for the job. We recommend that you contact the cleaning agent suppliers for further details involving performance and application. The suppliers' telephone numbers are available in the directory.

MICRO-90®

Aqueous

International Products Corp., P.O. Box 70, Burlington, NJ 08016-0070
Phone: 609-386-8770 Fax: 609-386-8438
E-mail: mkt@ipcol.com

PROPERTIES

Type of Cleaner:	**Concentrated Aqueous Detergent**
Active Ingredient:	Surfactants
CAS Number	**Mixture**
Cleaning System Options: **Immersion:** Yes	**Spray Wash:** No **Wipe:** Yes
Practical Use and Procedure Summary:	Make solutions of 1% to 2% in water, in temperatures from ambient to 150 °F, rinse thoroughly.
Cleaning Ability per Contaminant - Test Method:	ASTM G121/122
Contaminant:	Mobil 600
Average Initial Contamination Level (mg/m^2):	1735
Method:	Immersion
Time (minutes):	10 minutes
Cleaning Effectiveness Factor (CEF):	0.96 (Accuracy factor ±.01)

CEF = 0.96

Evaporation Rate Referenced to Butyl Acetate:	N/A	**Flammability**	
Vapor Pressure (mm Hg at 20 °C):	N/A	**Flammable**	No
Corrosivity (Al, Cu, Fe):	May etch aluminum	**Combustible**	No
pH:	9.5	**Flash Point**	None
Residue Potential:	Negligible if rinsed thoroughly	**LEL (%)**	N/A
		UEL (%)	N/A

ENVIRONMENTAL FACTORS

Health Hazard (MSDS):	Eye irritant
Carcinogen:	No
TLV-TWA (ppm):	Not determined
Carcinogen per CA Prop 65:	No
Sara Title III Section 313 Toxic:	None
OSHA PEL, PPM:	Not determined
ACGIH TLV, PPM:	Not determined
Acute Derma LD_{50} mg/kg H < 4,300:	Not determined
Acute Inhalation LD_{50} mg/m^3 H < 10,000 PPM:	Not determined
Fish Toxicity 96 HR LC_{50}, mg/L H, 500 mg/L:	Not determined
Ozone Depleting:	No
Volatile Organic Compound (Global Warming Issue):	None
EPA Clean Air Act Hazardous Air Pollutant:	No
RCRA Hazardous Waste:	No
On SNAP list:	Yes

OTHER

Storage Period:	1 year
Ease of Disposal/Recyclable:	No restrictions
Special Handling:	Normal handling procedures
Material Incompatibility:	Chlorine-based materials, aluminum, zinc
Warranty:	1 year
Availability:	Worldwide, orders normally shipped within 24 hours
Price/Unit:	Call 609-386-8770
Additional Information:	

MICRO-90® — Nonstandard Test

Aqueous

International Products Corp., P.O. Box 70, Burlington, NJ 08016-0070
Phone: 609-386-8770 Fax: 609-386-8438
E-mail: mkt@ipcol.com

PROPERTIES

Type of Cleaner:	**Concentrated Aqueous Detergent**
Active Ingredient:	Surfactants
CAS Number	**Mixture**
Cleaning System Options: **Immersion:** Yes	**Spray Wash:** No **Wipe:** Yes
Practical Use and Procedure Summary:	Make solutions of 1% to 2% in water, in temperatures from ambient to 150 °F, rinse thoroughly.
Cleaning Ability per Contaminant - Test Method:	ASTM G121/122
Contaminant:	Mobil 600
Average Initial Contamination Level (mg/m^2):	1532
Method:	Immersion
Time (minutes):	10 minutes
Cleaning Effectiveness Factor (CEF):	0.99 (Accuracy factor ±.01)

CEF = 0.99

Evaporation Rate Referenced to Butyl Acetate:	N/A	**Flammability**	
Vapor Pressure (mm Hg at 20 °C):	N/A	**Flammable**	No
Corrosivity (Al, Cu, Fe):	May etch aluminum	**Combustible**	No
pH:	9.5	**Flash Point**	None
Residue Potential:	Negligible if rinsed thoroughly	**LEL (%)**	N/A
		UEL (%)	N/A

ENVIRONMENTAL FACTORS

Health Hazard (MSDS):	Eye irritant
Carcinogen:	No
TLV-TWA (ppm):	Not determined
Carcinogen per CA Prop 65:	No
Sara Title III Section 313 Toxic:	None
OSHA PEL, PPM:	Not determined
ACGIH TLV, PPM:	Not determined
Acute Derma LD_{50} mg/kg H < 4,300:	Not determined
Acute Inhalation LD_{50} mg/m^3 H < 10,000 PPM:	Not determined
Fish Toxicity 96 HR LC_{50}, mg/L H, 500 mg/L:	Not determined
Ozone Depleting:	No
Volatile Organic Compound (Global Warming Issue):	None
EPA Clean Air Act Hazardous Air Pollutant:	No
RCRA Hazardous Waste:	No
On SNAP list:	Yes

OTHER

Storage Period:	1 year
Ease of Disposal/Recyclable:	No restrictions
Special Handling:	Normal handling procedures
Material Incompatibility:	Chlorine-based materials, aluminum, zinc
Warranty:	1 year
Availability:	Worldwide, Orders normally shipped within 24 hours
Price/Unit:	Call 609-386-8770

Additional Information: Test coupons wiped, rinsed with flowing D.I. water, followed by D.I. water immersion.