



*Your Environmental Specialists
Since 1969*

2121 E. Washington Blvd.
Fort Wayne, Indiana 46803

May 24, 2004

Mr. Terry Diskey
Applications Consultant
3736 Vanguard Drive
PO Box 9250
Fort Wayne, IN 46899-9250

Re: Analysis of Zero-Leak Gold Fittings per EMD-991 Specifications

Dear Mr. Diskey:

Enclosed are the results from the analytical testing of the Zero-Leak Gold Fittings per the requirements of Specification EMD-991.

The samples are identified as follows:

❖ Two Packets, 4-Parts per Packet, Product Part No. MS-505 and MS-506.

> **Project Description:**

Each individual sample was to be tested for total surface contaminate debris per unit surface area using surface flushing and micro-membrane filtration and gravimetric determination of retained residue. The individual membrane disks were then observed under magnification to determine retained debris approximate dimensions and quantities. Part specification require < 2.5 mg per 15.5 in², no more than 2 particles greater than 750x500 um (x-y) and no more than one particle per part with an "x" dimension greater than 1200 um .

> **Sample Description:**

The parts were received in individually sealed packets with four (4) parts of each description enclosed. The parts were analyzed as received.



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Re: Analysis of Zero-Leak Gold Fittings per EMD-991 Specifications

Dear Mr. Diskey:

Enclosed are the results from the analytical testing of the Zero-Leak Gold Fittings per the requirements of Specification EMD-991 (090382), International Truck and Engine Corporation.

The samples are identified as follows:

❖ Two Packets, 4-Parts per Packet, Product Part No. MS-505 and MS-506.

➤ **Project Description:**

Each individual sample was to be tested for total surface contaminate debris per unit surface area using surface flushing and micro-membrane filtration and gravimetric determination of retained residue. The individual membrane disks were then observed under magnification to determine retained debris approximate dimensions and quantities. Part specification require < 2.5 mg per 15.5 in², no more than 2 particles greater than 750x500 um (x-y) and no more than one particle per part with an "x" dimension greater than 1200 um .

➤ **Sample Description:**

The parts were received in individually sealed packets with four (4) parts of each description enclosed. The parts were analyzed as received.

Indiana Certifications: C-02-03, M-02-05
Phone: 260-424-1622 • 1-800-891-8442 • Fax: 260-424-9124
Web Site: www.edglo.com

➤ **Sample Preparation:**

No initial sample (part) pretreatment required. Method applied to parts as received. Chemical or physical preparatory work was not required for this project.

➤ **Sample Analysis:**

The parts were analyzed according to the procedure provided in Section 3 of the EMD 991 Methodology with the following notations:

- Deionized Reagent Water used for particulate flushing-extraction. Extraction volume of 100 ml of pre-filtered reagent water.
- Membrane Filters, Gelman, 47mm, 0.45 um
- Sec. 3.2.1 Procedure includes pre-washed gloves, beakers and forceps for handling of the parts and extraction vessels.
- Extraction fluid pre-filtered with 0.45 um filtration.
- All drying performed in convection oven at 103 +/- 2 Celsius.
- Optical Microscopy performed with Leica GZ6E Optical Stereo Microscope and Cole Parmer Graduated Reticle, 25 mm cross scale +/- 100 um graduations. Optical magnification was x15.
- Surface areas approximated using Folwer Sylvac Mark III Caliper, Model S225, S/N 116901.
- Surface area estimated using height, average diameter (inner-outer thread diameters) and addition of hex plug surface area. Areas determined to be 2.697 in² for MS-505 and 4.264 in² for MS-506

➤ **Sample Results and Discussion:**

The MS-505 individual parts did not exceed the Level A specification for surface contaminate debris 2.5 mg per 15.5 in². A single part of MS-505 did have a value of 0.074 mg per in² (0.43 mg per 15.5 in²).

None of MS-506 exceeded the Level A specification for surface contaminate debris 2.5 mg per 15.5 in². The individual parts did not have any measurable residue.

The particle size analysis indicated the following results:

MS-505 with 0.074 mg per in² contained four (4) retained particles (fibers) with the following dimensions (x-y):

1. 1000 x 25 um (fiber)
2. 900 x 25 um (fiber)
3. 1100 x 25 um (fiber)

No other particles were found on the membranes as observed above. This part did not exceed the 750x500 um (x-y) or 1200 um maximum x requirements.

The Blank solution membrane filter also contained two (2) retained particles (fibers) with the following dimensions (x-y):

1. 3600 x 25 um (both fibers)

The retained particles were fibrous in nature. None of the parts membrane filters retained any particles.

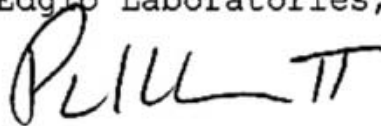
➤ **Enclosed Data Reports**

Data Summary Analytical Report
Raw Analytical Bench sheets

Edglo Laboratories appreciates the opportunity to provide EPCO Products with analytical services. Should you have any questions or comments concerning this analytical data report, please do not hesitate to contact me at 260-424-1622 or email to pknott@edglo.com.

EPCO Products, Inc.
EMD 991 Analytical Report
May 24, 2004
Page 4 of 4

Sincerely,
Edglo Laboratories, Inc.,

A handwritten signature in black ink, appearing to read "PKNOTT". The signature is written in a cursive, somewhat stylized font.

Paul Knott
Laboratory Director

Encl Surface Debris Analytical Data for Zero - Leak Gold Fittings

EPCO Products, Inc.
 Surface Debris Analysis on Zero - Leak Gold Fittings
 EMD-991 Level A Specification

Analytical Results Summary
 prepared by Edglo Laboratories, Inc.

Report Date: 5/24/2004
 Analytical Date: 05/23/2004

EPCO Part No. MS - 505

Sample Identification MS - 505	Initial Filter Weight (mg)	Final Filter Weight (mg)	Difference (mg)	Blank Normalized Difference (mg)	Surface Area (in ²)	Mass Per Unit Surface Area (mg/in ²)	Mass Per Unit Surface Area (mg/ 15.5in ²)
Blank	69.9	69.3	-0.6	0.0	2.697	<0.037	<0.213
1	70.2	69.8	-0.4	0.2	2.697	0.074	0.426
2	70.4	69.8	-0.6	0.0	2.697	<0.037	<0.213
3	70.0	69.4	-0.6	0.0	2.697	<0.037	<0.213
4	69.1	68.5	-0.6	0.0	2.697	<0.037	<0.213

EPCO Part No. MS - 506

Sample Identification MS - 506	Initial Filter Weight (mg)	Final Filter Weight (mg)	Difference (mg)	Blank Normalized Difference (mg)	Surface Area (in ²)	Mass Per Unit Surface Area (mg/in ²)	Mass Per Unit Surface Area (mg/ 15.5in ²)
Blank	69.9	69.3	-0.6	0.0	4.264	<0.023	<0.084
1	69.5	68.8	-0.7	-0.1	4.264	<0.023	<0.084
2	69.1	68.4	-0.7	-0.1	4.264	<0.023	<0.084
3	68.8	68.1	-0.7	-0.1	4.264	<0.023	<0.084
4	69.7	69.1	-0.6	0.0	4.264	<0.023	<0.084

EPCO Products, Inc.
 Surface Debris Analysis on Zero - Leak Gold Fittings
 EMD-991 Level A Specification

Analytical Results Summary
 prepared by Edglo Laboratories, Inc.

Report Date: 5/24/2004
 Analytical Date: 05/23/2004

EPCO Part No. MS - 505

Sample Identification MS - 505	Initial Filter Weight (mg)	Final Filter Weight (mg)	Difference (mg)	Blank Normalized Difference (mg)	Surface Area (in ²)	Mass Per Unit Surface Area (mg/in ²)
Blank	69.9	69.3	(-.6)	0	2.6967	20.037
1	70.2	69.8	(-.4)	+0.2	↓	0.074
2	70.4	69.8	(-.6)	0		20.037
3	70.0	69.4	(-.6)	0		20.037
4	69.1	68.5	(-.6)	0		20.037

EPCO Part No. MS - 506

Sample Identification MS - 506	Initial Filter Weight (mg)	Final Filter Weight (mg)	Difference (mg)	Blank Normalized Difference (mg)	Surface Area (in ²)	Mass Per Unit Surface Area (mg/in ²)
Blank	69.9	69.3	(-.6)	0	4.2637	20.023
1	69.5	68.8	(-.7)	(-.0.1)	↓	20.023
2	69.1	68.4	(-.7)	(-.0.1)		20.023
3	68.8	68.1	(-.7)	(-.0.1)		20.023
4	69.7	69.1	(-.6)	0		20.023