

# CONTAMINATION EVALUATION GUIDE

## FOR RATING HYDRAULIC FLUIDS

### OILGEAR FLUID CONDITION KIT

This publication will assist the Oilgear Fluid Condition Kit user to determine acceptability or remedial actions when evaluating solid contaminants found in a fluid sample drawing from a hydraulic system and deposited on a membrane filter. A standard sample of 100cc through a 47mm diameter filter processed in our laboratory or a 40cc sample through a 25mm diameter filter processed by the Oilgear Fluid Condition Kit is used.

Detailed studies show much of hydraulic system maintenance costs are due to contamination. Every fluid system is contaminated and regulation of this contamination is very important as contaminants breed more contaminants and the effect "multiplies". Contaminants are catalysts which speed oxidation, fluid breakdown and deterioration, causes wear, leads to seal repairs, leaks and component malfunctions. All these problems can result in down-time, equipment failures, maintenance, repair and/or replacement costs.



Figure 1. OILGEAR FLUID CONDITION KIT contents (55173).

Using an Oilgear Fluid Condition Kit and this publication, contamination can be identified BEFORE it becomes a big problem. Following these step by step instructions and using the assessment charts provides a quick and easy evaluation of contamination levels. Should further verification be required, submit the easily handled membrane filter and/or representative fluid samples in the bottles provided to the fluid manufacturer for chemical, viscosity or other analysis.

### STEP BY STEP INSTRUCTIONS

#### KIT COMPONENTS:

Before using the Oilgear Fluid Condition Kit be sure you have all the components and that they are CLEAN. Each kit includes: one large beaker; one small beaker; one syringe; a metal "T" shaped three-way valve (repair kit and assembly instructions included); a filter housing assembly (screen and o-ring included); one forceps; eight micron filter paper discs; a box of glass slides; one seven inch and one thirty-six inch pieces of plastic tubing; solvent; one roll mending tape; a ten power magnifier with built-in light; four 125 ml bottles; one felt tip maker; two "C" size batteries; one metal sinker; one Contamination Evaluation Guide and a travel case.

#### NOTE:

A eleven minute video tape production outlining Fluid Condition Kit components, usage and examples of typical fluid contaminate types and levels is now available. Please contact The Oilgear Company, Sales Department, for pricing and delivery information.

#### TAKING FLUID SAMPLE:

Fluid samples should represent what is passing through the system and drawn from active areas of the reservoir after system temperature stabilizes. DO NOT sample after a shut down period which would have allowed contamination to settle out. Before any sampling, wipe the immediate area clean to avoid possible contamination by external dirt. Samples may be drawn near reservoir suction or return lines or from a auxiliary or main pump pressure line during low pressure cycle.

#### CAUTION!

DO NOT sample from a high pressure line. A valve "cracked" down at high pressure tends to filter out dirt and CAN NOT be used.

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Fluid may be sampled from a low pressure valve such as found at the reservoir base however, if sample is to be taken from such a valve, allow several gallons of fluid to "flush" valve eliminating any settled dirt in calm areas **BEFORE** sampling.

### FILLING THE SYRINGE:

If fluid is readily available, or if small beaker is used to carry fluid to test area, insert syringe into fluid and withdraw a 20cc sample by pulling back on syringe plunger. **DO NOT USE THE 7 INCH TUBE!**

If fluid is to be drawn from system reservoir or some other hard to reach area, assemble syringe to 3-way valve connector by turning valve connector into syringe coupling and then attach the 3 foot length of tubing with sinker to 3-way valve connector. Drop weighted (sinker) end of tubing into fluid and withdraw a 20cc sample by pulling back on syringe plunger. Expel and draw fluid about 5 times to get a good sample in the syringe.

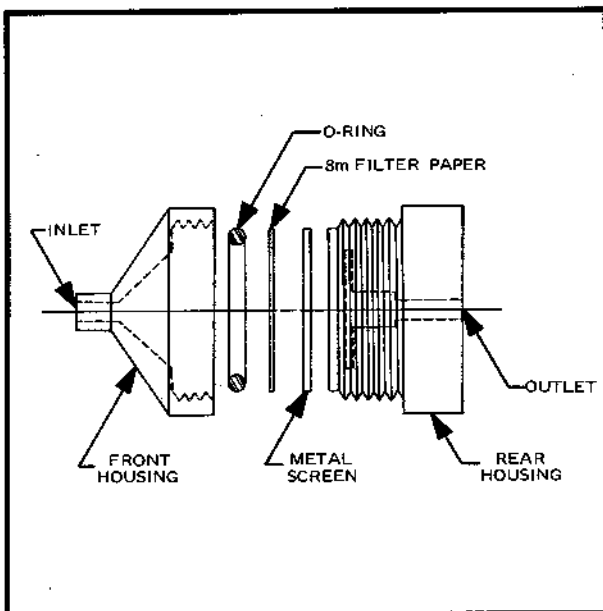


Figure 2. Parts drawing of proper filter housing assembly.

### INSERTING FILTER PAPER:

Refer to figure 2. Unscrew the halves of filter housing. Using the forceps to avoid contamination with hands, insert a **CLEAN** piece of eight micron filter paper between the o-ring (inlet end - front housing half) and the metal screen (outlet end - rear housing half).

### CAUTION!

The eight micron filter papers are **WHITE** separated by thin **BLUE** waxed type papers **DO NOT USE** these thin **BLUE** waxed papers as the filter papers.

Re-assemble the filter housing by screwing housing halves together **FINGER TIGHT**.

### FILTERING THE SAMPLE:

Assemble syringe to 3-way valve connector by turning valve connector into syringe coupling. Attach filter housing assembly to opposite end of 3-way valve connector by turning filter housing assembly into 3-way valve connector coupling. Point the syringe down over the large waste beaker or back into the reservoir. Press down on syringe plunger and pass the drawn fluid sample through the filter paper. Repeat the procedure a second time so a total of 40cc's of fluid is filtered.

### CAUTION!

When depressing syringe plunger use **FINGER PRESSURE ONLY** to avoid bursting syringe. Remove the 3' length of tubing and pump plunger several times with air to eliminate as much fluid from the syringe as possible.

### WASHING WITH SOLVENT:

Attach the 7 inch tube to the 3-way valve tube connection. Insert tube into the solvent and draw 10cc's into the syringe. Point syringe down over the large beaker and slowly (approximately 10 seconds) pass the solvent through the filter. After the solvent is passed through the filter, pump syringe plunger many times to air dry the filter. Repeat this procedure a second time.

### IMPORTANT!

When preparing syringe for storage make certain syringe is lightly oiled to prevent any "freeze-up".

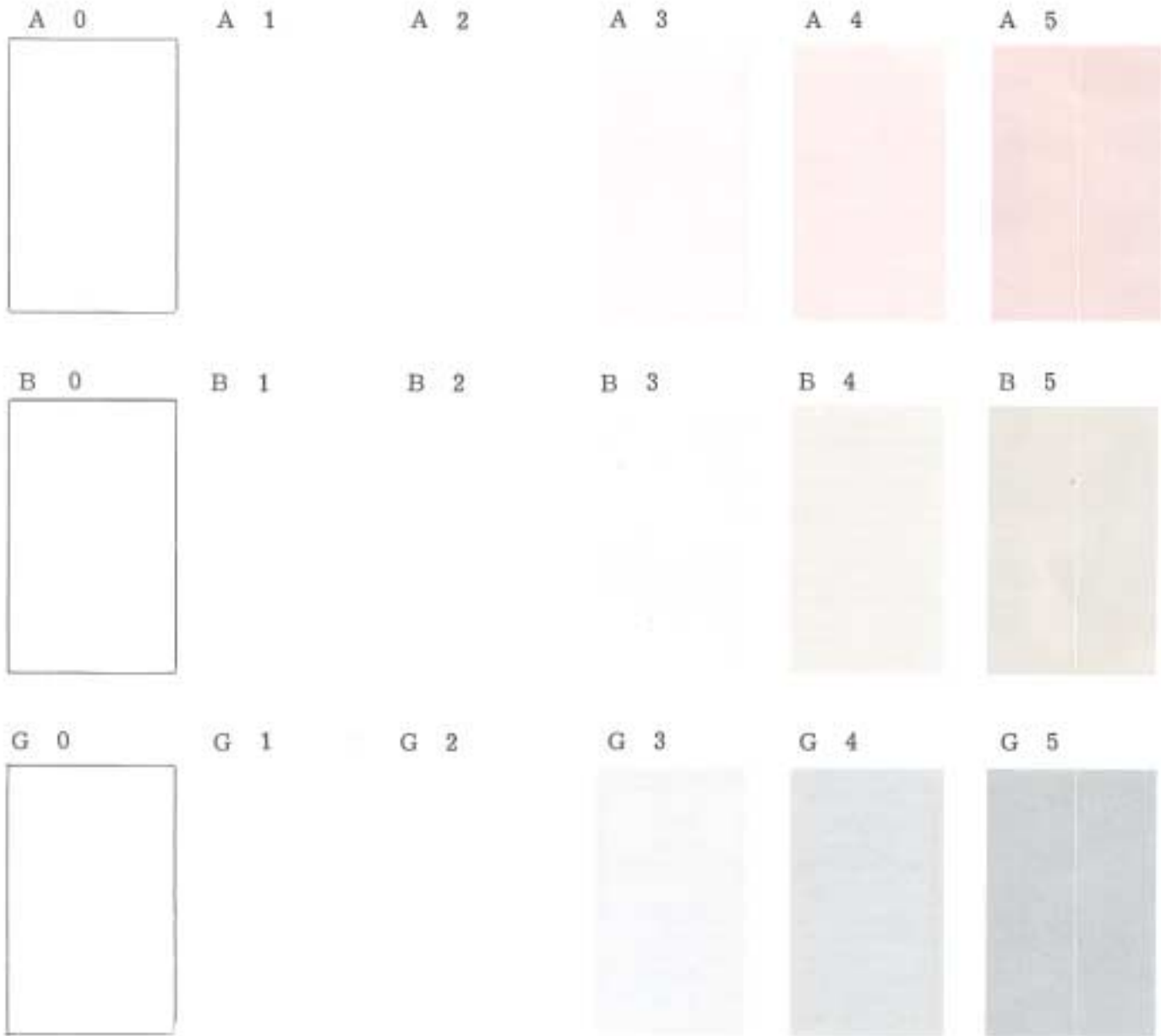
### REMOVING THE FILTER PAPER:

Hinge two glass slides together with a piece of mending tape over one of the short ends. Open filter housing assembly and using forceps gently remove filter paper and let air dry for one minute. Lay filter paper on bottom slide, close top slide and with a piece of mending tape seal the opposite short end and properly identify the sample. Documentation or retention of slides taken over a period of time for a particular machine will allow you to determine if problems are developing or if the filtration is adequate.

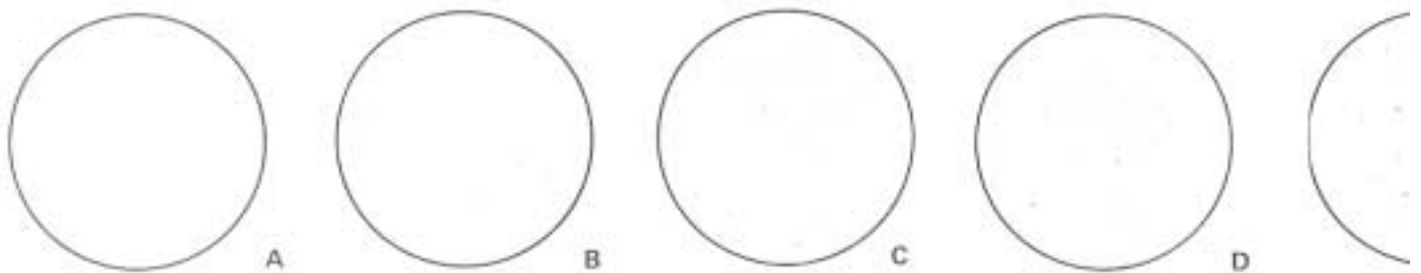
### EXAMINING THE FILTER PAPER:

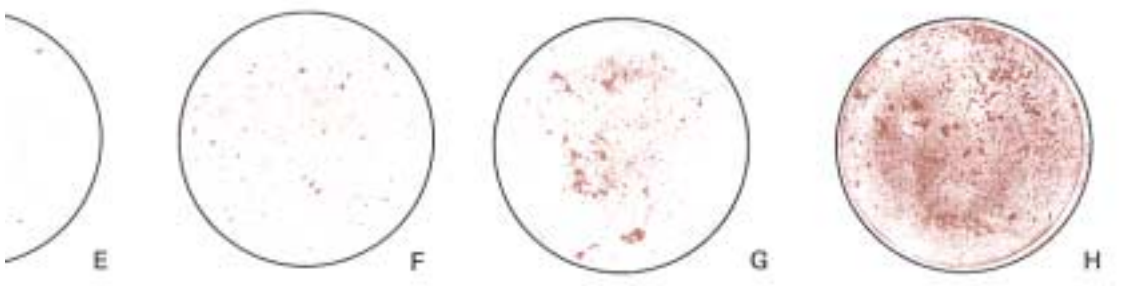
Use the 10 power magnifier to examine the filter paper surface for foreign particles. Any particle with a clearly visible outline is over 25 microns (.001 inch) in size. The human eye can see particles of about 40 microns in diameter (an average human hair is about 75 microns in diameter) therefore, any particle easily recognizable should have been removed by the recommended filters.

COLOR AND INTENSITY



PARTICLE ASSESSMENT





## FLUID EVALUATION

In making a visual assessment of the membrane filter, the intensity of the background (caused by the fine particles) should be evaluated separately from the large visible particles (without magnifier).

Compare sample color and intensity with the examples found on pages 3 and 4. First decide if the color is rusty, tan or gray (scales A, B or G). Match the color intensity with grades 1 thru 10. Finally, ignoring the color and intensity, match the visible particles to the "Particle Assessment Scale". Note the size and number of large particles and arrive at a letter value of A thru H.

You now have a contamination description consisting of a Color Letter, Color Intensity Number and a Particle Assessment letter. For example: G3C would be gray color, third intensity with C type particles. Using the Intensity Number and Particle Letter

located on the Acceptability Chart, the former example indicates needed filtration.

### CAUTION!

This test is only for solid contaminants. Liquid or gaseous contaminants and/or chemical and improper viscosity could also be present. Keep in mind that each time the 7 inch tube is placed in the solvent can debris goes along with it. Also, there is dust in the air which will settle on the filter housing assembly halves during assembly and disassembly procedures. Experience has shown this amount of contamination is so negligible to the usual amount of contamination that it may be neglected. This should occasionally be verified by running the test procedure using only solvent without fluid sample to check the contamination in the components.

## EVALUATION ACCEPTABILITY CHART FOR AVERAGE SYSTEMS

COLOR INTENSITY FOR A, B OR G

		0	1	2	3	4	5	6	7	8
PARTICLE ASSESSMENT	A	1								
	B		2							
	C			3						
	D					4				
	E									
	F									



Presently acceptable level for typical Oilgear systems.



Acceptable level for D, PVW and FCS pump systems. For remaining systems add adequate filtration until fluid reaches an acceptable level. Refer to Bulletin 90007.



Add adequate filtration until fluid reaches acceptable level (all systems). Refer to Bulletin 90007.



Drain and thoroughly clean the system, refill with fluid of acceptable contamination level.

# CONTAMINATION ANALYSIS SERVICE

## CONTAMINATION REPORT REQUESTS:

Refer to figure 3. For each fluid sample submitted to The Oilgear Company a completed Contamination Report is forwarded to the user documenting test results and suggesting, if necessary, appropriate remedial actions to be taken. Tests consist of a particle evaluation of the fluid broken into specific ranges, color, intensity and assessment ratings for each sample submitted.

If requested, the presence of water will be noted and/or the viscosity of the fluid will be determined.

Using the service is easy, simply:

1. Draw a fluid sample from your system and place it in a 125 ml bottle from the Oilgear Fluid Contamination Kit or other suitable, sealable, CLEAN container.
2. Submit fluid sample to the Oilgear Company for analysis, with a return address and the name of the person to whom the report should be sent.

### IMPORTANT!

This service is provided to our customers and references contamination ONLY. For analysis of additives and other fluid characteristics consult the fluid manufacturer.

All fluid samples received are tested, graded and the results returned to the user in a timely manner with recommendations, if any, as to corrective actions which should be performed.

A correlation between the Oilgear Intensity Level and the ISO code is shown below.

OILGEAR INTENSITY LEVEL	ISO CODE
5	23/20
4	21/28
3	20/17
2	19/16
1	18/15
0	17/14
	16/13
	15/11

Refer to Bulletin 90007

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CONTAMINATION REPORT  
(Form Completion To Dotted Line Required by Customer or Service Technician)

Fluid Sample I.D. No. \_\_\_\_\_ Date: \_\_\_\_\_  
Requested By: \_\_\_\_\_ Oilgear Office: \_\_\_\_\_  
Customer: \_\_\_\_\_  
Address: \_\_\_\_\_  
Oilgear Equipment: \_\_\_\_\_ System: \_\_\_\_\_  
Fluid Drawn From (Location): \_\_\_\_\_ Fluid Product Type: \_\_\_\_\_

Viscosity @ 100° F: \_\_\_\_\_ SSU      Percentage Of Water  
 Less Than 1%     Greater Than 1%  
(.1% Maximum Allowable)

**OILGEAR RATING**

Color: \_\_\_\_\_ Intensity: \_\_\_\_\_ Particle Assessment: \_\_\_\_\_  
(The above is in reference to the Oilgear "Contamination Evaluation Guide" Bulletin 90094)  
 Contamination Range: \_\_\_\_\_ Microns  
 Background Particle Description: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Foreground Particle Description: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**FLUID RECOMMENDATIONS**  
(Refer to Oilgear Bulletin 90007)

1 Presently Acceptable Level For Typical Oilgear Systems.  
 2 Add Adequate Filtration Until Fluid Reaches Acceptable Level.  
 3 Add Adequate Filtration Until Fluid Reaches Acceptable Level ("D" and "PVW" Pump System).  
 4 Drain And Thoroughly Clean The System, Refill With Fluid Of Acceptable Contamination Level.

This Report is In Reference To Contamination Only. For Analysis Of Additives And Other Fluid Characteristics Consult The Fluid Manufacturer.

Technician: \_\_\_\_\_  
Engineering Laboratory  
TOC-944-A

Figure 3. Example of the Oilgear Company Contamination Report form (TOC-944).

### NOTES:



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