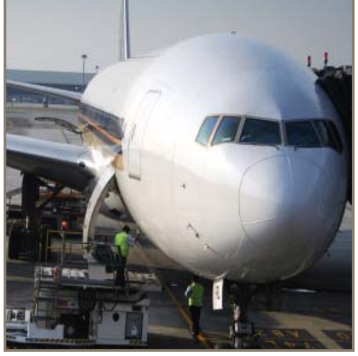


aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Par-Test™

Fluid Analysis

Parker

ENGINEERING YOUR SUCCESS.

Fluid Analysis

Par-Test™

Fluid analysis has proven to be a critical tool for any preventive maintenance program. Fluid analysis is able to identify potential problems that cannot be detected by human senses.

A comprehensive fluid analysis program can help prevent major hydraulic or lube oil system failures.

Par-Test is a complete laboratory analysis, performed on a small volume of fluid. The report you receive is a neatly organized three page format. One may quickly analyze the test results of an individual sample and/or look at a trend analysis for up to five different samples. Two types of services are offered through Par-Test, a water base fluid analysis kit or a petroleum base fluid analysis kit. For both types of services the Par-Test kit includes a pre-cleaned glass bottle, mailing container with pre-addressed label, sample information data sheet (to be completely filled out by end user) and the following analysis:

Fluid sampling for Par-Test involves important steps to insure you are getting a representative sample. Often, erroneous sample procedures will disguise the true nature of the system fluid. A complete sampling procedure is detailed on the back of this brochure. There also is a National Fluid Power Association standard (NFPA T2.9.1-1972) and an American National Standards Institute Standard (ANSI B93.13-1972) for extracting samples from a fluid power system.

Petroleum Base Kit
Particle Count
Photomicrograph
Free Water Analysis
Spectrometric Analysis
Viscosity Analysis
Water Analysis (PPM)
Neutralization Analysis

Water Base Kit
Particle Count
Photomicrograph
Spectrometric Analysis
Viscosity Analysis
Neutralization Analysis

How to Order

Description	**Part Number**
Petroleum base fluid kit (single test bottle)	927292
Petroleum base fluid kit (Carton of 10 test bottles)	927293
Water base fluid kit (single test bottle)	932995

Fluid Analysis

Par-Test™

FLUID ANALYSIS REPORT

SAMPLE CODE: 93844 DATE: 09/01/04

Parker Hannifan
16810 Fulton Rd. Co #2
Metamora, OH, 43540

ATTN: Kevin Noe

PARTEST Fluid Analysis Service
Parker Hannifin Corporation
1016 E. Airport Rd.
Stillwater, OK 74075
Tele: (405)624-0400
Fax: (405)624-0401

COMPANY NAME:	ABC Corporation	**SAMPLE DATE:**	7/12/2004
SYSTEM TYPE:	Hydraulic	**HOURS:**	(on oil) 948 (on unit) 2000
EQUIPMENT TYPE:	Press	**SYSTEM VOLUME:**	200 Gallons
MACHINE ID:	Machine #1	**FLUID TYPE:**	AW 46
FILTER ID:	Parker 10 micron	**ANALYSIS PERFORMED:**	N2,S,T,V4,W

AUTOMATIC PARTICLE COUNT ISO 11171

Size	Counts per ml.	ISO Code
>4 µm(c)	35000.0	
>6 µm(c)	15498.0	
>10 µm(c)	6000.0	
>14 µm(c)	2600.0	22/21/19
>21 µm(c)	1468.0	
>38 µm(c)	754.0	
>50 µm(c)	58.0	
>70 µm(c)	3.0	

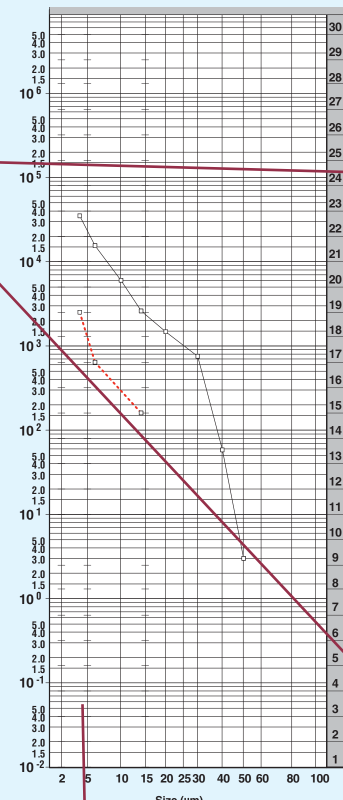
FREE WATER PRESENT

☐ YES

☒ NO

PHOTO ANALYSIS

Mag.: 160x Vol 20ml Scale: 1 div = 20 µm



ALARMS/REMARKS

*The red line in the ISO chart graph indicates recommended cleanliness level.

For our Par-Test™ customers, the analysis report is available online for your ease and convenience. Historical data is also available. Visit www.partestlab.com

Sample Data

Information supplied by the user regarding the fluid to be analyzed. Complete and accurate information is crucial for a useful analysis.

Particle Count

Results are reported over 6 different particle size ranges and expressed as an ISO code (modified). The counts are per milliliter of fluid and the reporting is cumulative; ie. The particle count in the >2 micron row includes the number of particles greater than 5, 10, 15, 25 and 50 microns as well as particles between 2-5 microns in size. Particle resuspension method is utilized for water based fluid samples.

Free Water Analysis

Determines if the water present is beyond the saturation point of the fluid. At the saturation point, the fluid can no longer dissolve or hold any more water. Its appearance becomes cloudy or "milky". Many hydraulic oils saturate between 500 and 1000 PPM of water.

Photo Analysis

A photomicrograph of a small volume of fluid (20 ml) magnified 100X. This analysis gives a quick glance at the contamination present in the fluid. Each line of the graduated scale represents 20 microns in size.

The full color photomicrograph helps identify particles which would otherwise be grouped by class.

ISO Chart

Graphically illustrates the particle count on a graph. The recommended cleanliness code level, if given on the submittal form, is shown by a broken line on the ISO chart.

Fluid Analysis

Par-Test™

FLUID ANALYSIS REPORT

SAMPLE CODE: 93844 DATE: 09/01/04

Parker Hannifan
16810 Fulton Rd. Co #2
Metamora, OH, 43540

ATTN: Kevin Noe

PARTEST Fluid Analysis Service
Parker Hannifin Corporation
1016 E. Airport Rd.
Stillwater, OK 74075
Tele: (405)624-0400
Fax: (405)624-0401

SPECTROMETRIC ANALYSIS		
WEAR METALS AND ADDITIVES	PPM BY WEIGHT	STATUS*
IRON	120.0	H
COPPER	510.0	H
CHROMIUM	< 1.0	N
LEAD	< 1.0	N
ALUMINUM	1.0	N
TIN	< 1.0	N
SILICON	< 1.0	N
ZINC	423.0	N
MAGNESIUM	< 1.0	N
CALCIUM	540.0	H
PHOSPHORUS	10.0	L
BARIUM	1.0	N
BORON	< 1.0	N
SODIUM	< 1.0	N
MOLYBDENUM	< 1.0	N
SILVER	< 1.0	N
NICKEL	< 1.0	N
TITANIUM	< 1.0	N
MANGANESE	< 1.0	N
ANTIMONY	< 1.0	N

L = LOW N = NORMAL H= HIGH

The Spectometic Analysis reports the ppm level of 20 different wear metals and additives in the sample. Generally the first 7 and last 5 elements are considered wear elements not normally present in hydraulic oil. Zinc through molybdenum (shaded) represent some common additives in oil. If a baseline oil sample (new oil out of a drum) is provide, then comments on the analyzed sample can be provided on whether the status of the elements are low, normal, or high.

Viscosity Analysis - ASTM D445			
CST@100C:		SSU@210F:	
CST@40C:	46.25	SSU@100F:	215.0

Viscosity at 40C (100F) is reported in Centistokes (cST) and SUS (Saybolt Universal Seconds). The test is conducted in accordance with ASTM D445 procedures for determining the kinematic viscosity of fluids

Neutralization Analysis - ASTM D794	
TAN:	0.44

The Total Acid Number (TAN) test measures the acidity of a hydraulic fluid. The higher the number, the more acidic the fluid. Over time this may mean the fluid is becoming oxidized.

Water Analysis - ASTM D6304	
WATER CONTENT (PPM):	410.0

The water analysis test shows the actual parts per million of water in a sample. This is known as the Karl Fischer titration test and is conducted in accordance with ASTM D6304.

Comments

*Please check spectrometric status for abnormal conditions.

Viscosity Analysis

Viscosity is a very important property of a fluid in terms of system performance. Viscosity expresses the internal friction between molecules in the fluid. Typically a breakdown in viscosity will be seen as an increase. Both SSU at 100º F and cSt at 40º C are reported.

Neutralization Analysis

Referred to as the Total Acid Number (TAN) this titration test measures the acid level of the sample fluid. The production of acidic material causes oxidation degradation or aging of most fluids. This activity is promoted by elevated temperatures, presence of entrained metal particles, and intimate contact with air. It is the rate of increase of the TAN during any given time period that is significant, not just the absolute value.

Water Analysis

Karl Fischer test gives accurate measure of water concentration in the sample fluid. The results are reported in parts per million (PPM) and allow for detection of water levels well below the saturation point.

Remarks

Quick statements or alerts about any unusual results from one of the tests reported on this page.

Spectrometric Analysis

Results obtained by Rotating Disk Electrode (ROE) Spectrometer and reported in terms of parts per million (PPM). Twenty different wear metals and additives are analyzed to help determine the condition of the fluid. The spectrometric test is limited to identifying particles below 5-7 micron in size. Base line (new) fluid samples should be sent in for each different fluid to be analyzed. This will be used to determine the status.

WEAR METALS AND ADDITIVES

Iron: Ferrous wear particle typically from pumps, gears, cylinders, or rust

Copper: Brass (copper/zinc) and bronze (copper/tin) in bearings and bushings

Chromium: (white non ferrous metal) Chrome from cylinder rods, bearings, valve spools

Lead: Babbitt or copper lead bearings

Aluminum: White nonferrous metal from pump bodies, bushings, bearings, and grinding compounds

Tin: Babbitt bearings, plating

Silicon: Sand/dirt contamination or antifoaming additive in oil

Zinc: Plating or anti-wear additive in oil

Magnesium: Detergent, dispersive additive in oil, bearings, water

Calcium: Dispersant additive or acid neutralizer

Phosphorous: Anti-wear or fire resistant additive in fluid

Barium: Corrosion, rust inhibitor additive in oil

Boron: Detergent, dispersive additive in oil

Sodium: Detergent or coolant additive

Molybdenum: Alloy metal or anti friction additive

Silver: White non ferrous metal

Nickel: Alloy metal

Titanium: White non ferrous metal

Manganese: White non ferrous metal

Antimony: Babbit bearings, greases

Fluid Analysis

Par-Test™

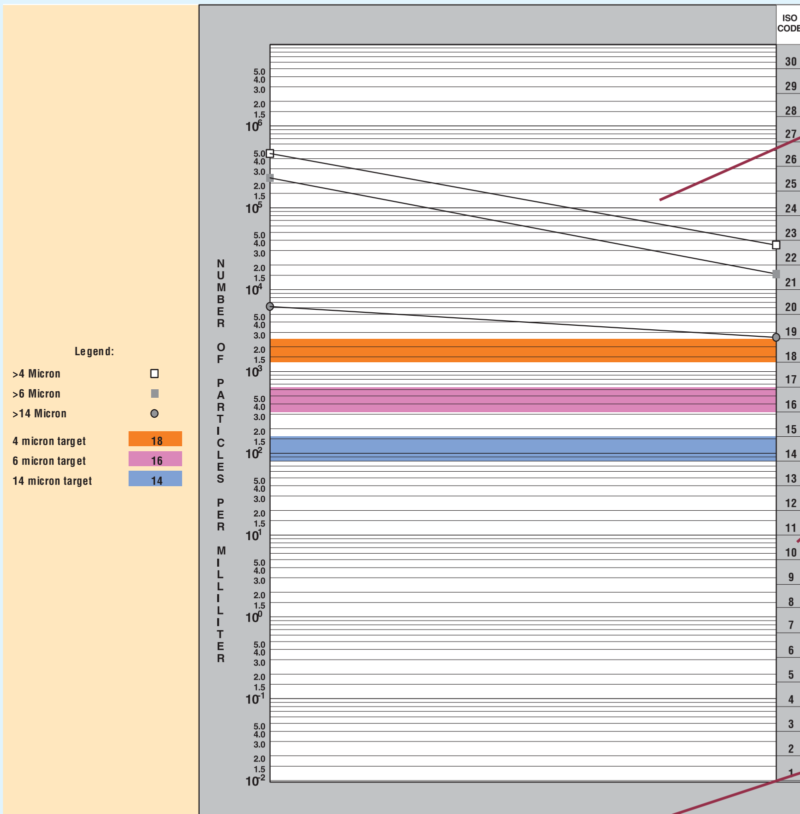
FLUID ANALYSIS REPORT

SAMPLE CODE: 93844 DATE: 09/01/04

Parker Hannifan
16810 Fulton Rd. Co #2
Metamora, OH, 43540

ATTN: Kevin Noe

PARTEST Fluid Analysis Service
Parker Hannifin Corporation
1016 E. Airport Rd.
Stillwater, OK 74075
Tele: (405)624-0400
Fax: (405)624-0401



DATE	7/6/2004	7/12/2004
PARTICLES > 4 MICRONS	457895	35000
PARTICLES > 6 MICRONS	231456	15498
PARTICLES > 14 MICRONS	6210	2600
ISO CLEANLINESS CODE	26/25/20	22/21/19
SAMPLE CODE	93843	93844

For our Par-Test™ customers, the analysis report is available online for your ease and convenience. Historical data is also available. Visit www.partestlab.com

Trend Analysis

Graphical history for up to 5 samples plotted for 2, 5 and 15 micron and greater size particles. This analysis is a valuable tool for tracking the progress of a system over a given time period.

ISO Range Code

Index Number that is associated with a range of particles. Below is a list of the range numbers and the corresponding particle quantities.

Sample Code

Assigned to the test kit form for a ready reference. This code can be used to track the sample from start to finish.

NUMBER OF PARTICLES PER ML

Range Code	More than	Up to and including	Range Code	More than	Up to and including
30	5,000,000	10,000,000	18	1,300	2,500
29	2,500,000	5,000,000	17	640	1,300
28	1,300,000	2,500,000	16	320	640
27	640,000	1,300,000	15	160	320
26	320,000	640,000	14	80	160
25	160,000	320,000	13	40	80
24	80,000	160,000	12	20	40
23	40,000	80,000	11	10	20
22	20,000	40,000	10	5	10
21	10,000	20,000	9	2.5	5
20	5,000	10,000	8	1.3	2.5
19	2,500	5,000	7	.64	1.3
			6	.32	.64

Fluid Analysis

Par-Test™

SAMPLING PROCEDURE

Obtaining a fluid sample for analysis involves important steps to make sure you are getting a representative sample. Often erroneous sampling procedures will disguise the true nature of system cleanliness levels. Use one of the following methods to obtain a representative system sample.

I. For systems with a sampling valve

A. Operate system for at least 1/2 hour.
B. With the system operating, open the sample valve allowing 200 ml to 500 ml (7 to 16 ounces) of fluid to flush the sampling port. (The sample valve design should provide turbulent flow through the sampling port.)
C. Using a wide mouth, pre-cleaned sampling bottle, remove the bottle cap and place in the stream of flow from the sampling valve. Do NOT “rinse” out the bottle with initial sample.
D. Close the sample bottle immediately. Next, close the sampling valve. (Make prior provision to “catch” the fluid while removing the bottle from the stream.)
E. Tag the sample bottle with pertinent data; include date, machine number, fluid supplier, fluid number code, fluid type, and time elapsed since last sample (if any).

II. Systems without a sampling valve

There are two locations to obtain a sample in a system without a sampling valve: in-tank and in the line. The procedure for both follows:

A. In the Tank Sampling

1. Operate the system for at least 1/2 hour.
2. Use a small hand-held vacuum pump to extract sample. Insert sampling device into the tank to one half of the fluid height. You will probably have to weight the end of the sampling tube. Your objective is to obtain a sample in the middle portion of the tank. Avoid the top or bottom of the tank. Do not let the syringe or tubing came in contact with the side of the tank.
3. Put extracted fluid into an approved, pre-cleaned sample bottle as described in the previous sampling valve method.
4. Cap immediately.
5. Tag with information as described in sampling valve method.

B. In-line Sampling

1. Operate the system for at least 1/2 hour.
2. Locate a suitable valve in the system where turbulent flow can be obtained (ball valve is preferred). If no such valve exists, locate a fitting which can be easily opened to provide turbulent flow (tee or elbow).
3. Flush the valve or fitting sample point with a filtered solvent. Open valve or fitting and allow adequate flushing. (Take care to allow for this step. Direct sample back to tank or into a large container. It is not necessary to discard this fluid.)
4. Place in an approved, pre-cleaned sample bottle under the stream of flow per sampling valve methods.
5. Cap sample bottle immediately.
6. Tag with important information per the sampling valve method.
Note: Select a valve or fitting where the pressure is limited to 200 PSIG (14 bar) or less.

ON-SITE FLUID ANALYSIS PRODUCT