American Chemical Technologies
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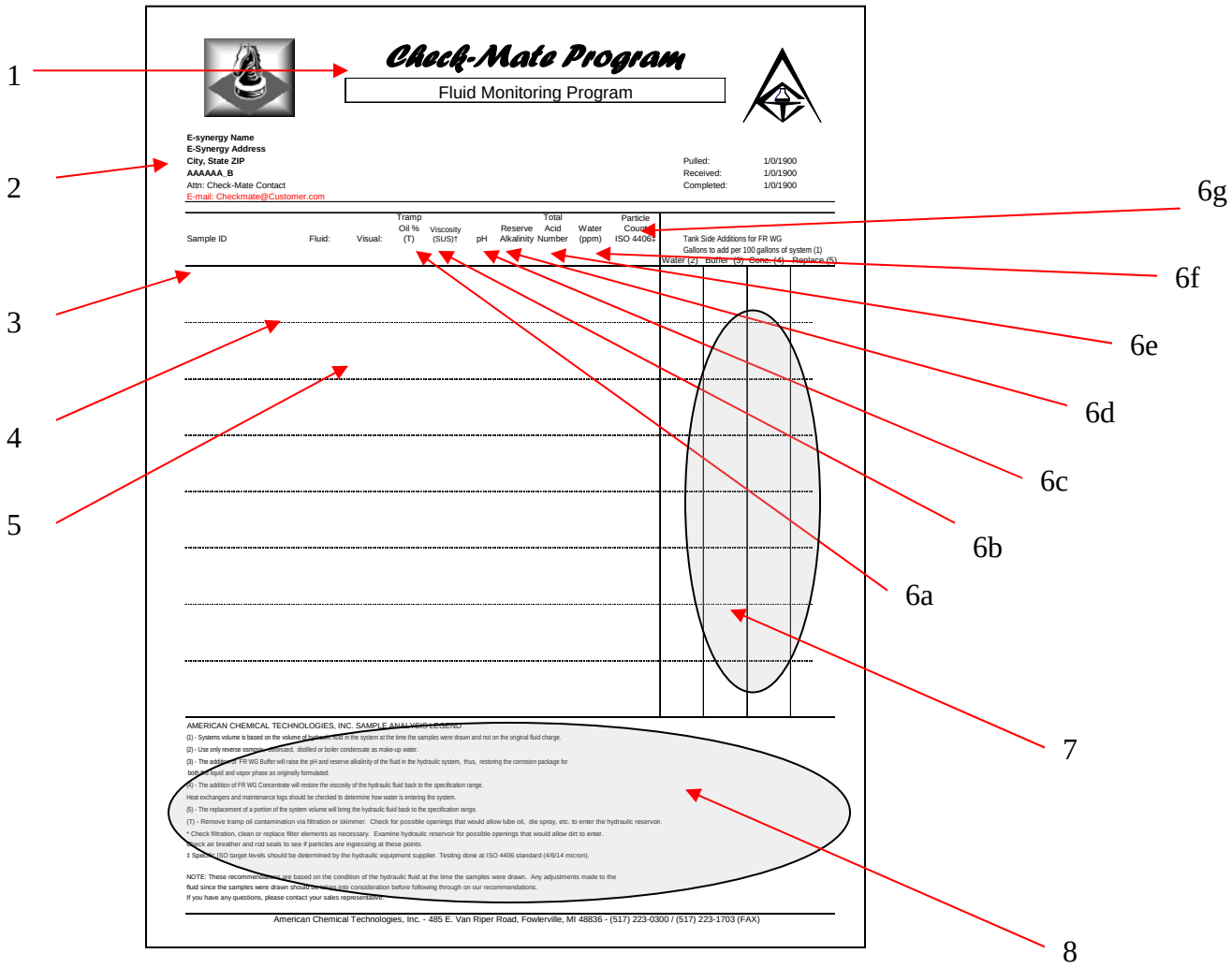
Laboratory Service Report

Getting the most out of a CHECK-MATE PROGRAM SUMMARY REPORT



1) The CHECK-MATE PROGRAM monitors the condition of the hydraulic fluid with the understanding that preventative maintenance is better than system repair. Key properties of the supplied hydraulic fluids are identified. Optimum operating ranges are provided for each monitored property. When any property is outside of the recommended range, the value is typically highlighted in some way.
2) The contact information provides routing as to where the samples were generated and to who gets the report. If any of this information is incorrect, please contact your local American Chemical Technologies sales representative listed on the right hand side of the Trending Reports.

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3) The SUMMARY REPORT provides a listing of all sample descriptions that have been analyzed for a customer account. The Summary Report provides sample data for only the most current sample submitted. The data that is measured for only a few fluid product types is not listed in the SUMMARY REPORT but can be found on the TRENDING REPORT: specific gravity, brix°, fungus/bacteria culture, sheen, Viscosity (cSt), and customer specific data.
4) The type of fluid is listed based upon the best information that is obtained with the sample.
5) The VISUAL appearance of the sample is evaluated to determine the general condition of the fluid. Contamination of degrading of the hydraulic fluid can cause any or all of the following visual changes to the hydraulic fluid: clear, hazy cloudy; changes in color, lightening or darkening.
6) Major hydraulic fluid properties are listed on the Summary Sheet. When a value is reported in RED, this property is seen as being "OUT OF SPECIFICATION" and preventative maintenance on the system is recommended. . When a system has properties reported in RED, review of the TRENDING REPORT for that system will allow you to determine three things: 1) why the value is highlighted, 2) if the highlight is a special cause, or 3) if the system is historically out of specification.
    a. TRAMP OIL is any liquid contaminant that is present at a high enough concentration to form a distinct second layer in the sample after the sample has been allowed to sit without agitation for more than 24 hours. Depending upon the hydraulic fluid composition, tramp oil can be any or all of the following: petroleum oil/grease, vegetable oil/animal fat, synthetic oils, water/glycols. Tramp oil present in a well mixed sample can make the sample appear hazy or cloudy (see #5).
    b. FOREIGN OIL is any liquid contaminant that is not a component of the hydraulic fluid as supplied by the manufacturer and can be identified by some physical or chemical means.
    c. VISCOSITY is the resistance that the hydraulic fluid has to flow. The kinematic viscosity is reported in SUS or USS (Universal Saybolt Seconds) at 100°F. Measurement of the kinematic viscosity is done in according to ASTM 446 Standard Specifications and Operating Instructions for Glass Capillary Kinematic Viscometers.
    d. pH of a hydraulic fluid determines if a hydraulic fluid is acidic or alkaline. A neutral solution is one in which the hydrogen ion concentration (acidity) is equal to the hydroxide ion concentration (alkalinity). In pure water, this occurs at a pH of 7.0. A buffer is used to help maintain the pH in a desired range. A buffer acts as a cushion against the effects of both acids and alkali. Measurement of the pH is performed using ASTM E70-07 Standard Test Method for pH of Aqueous Solutions with the Glass Electrode.
    e. The RESERVE ALKALINITY or total base number can be measured for hydraulic fluids that are buffered to a pH above 7.0. The reserve alkalinity is a measure of a hydraulic fluids ability to neutralize acid using ASTM

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D4739 Test Method for Base Number Determination by Potentiometric Titration.

f. The TOTAL ACID NUMBER is the number of ASTM D664 Test Method for Acid Number of Petroleum Products by Potentiometric Titration is used to measure the build-up of acidity in non-buffered hydraulic oils.

g. Water content of the hydraulic fluid is measured using either ASTM E1064-05 Standard Test Method for Water in Organic Liquids by Coulometric Karl Fischer Titration or ASTM D95-05e1 Standard Test Method for Water in Petroleum Products and Bituminous Materials by Distillation.

h. For APC (Automatic Particle Counter) counts, the revised procedure, ISO FDIS 4406.2 "Hydraulic fluid power – Fluids – Code for defining the level of contamination of solid particles," 1999, uses three cleanliness code numbers, corresponding to the concentrations of particles larger than 4 µm(c), 6 µm(c), 14 µm(c) with the new calibration method. The specific ISO particle count target should be based upon the desired level of cleanliness and the specifications for a filter element with the listed micron rating. According to Machinery Lubrication pg 68 Sept-Oct 2005, typical cleanliness recommendations are as follows:

Operating Pressure →	<1,500 psi	1,500-2,500 psi	>2,500 psi
Servo Valve	16/14/12	15/13/11	14/12/10
Proportional Valve	17/15/12	16/14/12	15/13/11
Variable Volume Pump	17/16/13	17/15/12	16/14/12
Cartridge Valve	18/16/14	17/16/13	17/15/12
Fixed Piston Pump	18/16/14	17/16/13	17/15/12
Vane Pump	19/17/14	18/16/14	17/16/13
Pressure/Flow Control Valve	19/17/14	18/16/14	17/16/13
Solenoid Valve	19/17/14	18/16/14	18/16/14
Gear Pump	19/17/14	18/16/14	18/16/14

Adjust to cleaner levels for duty cycle severity, machine criticality, fluid type (water base) and safety concerns.

Table 1 Typical Cleanliness Recommendations

7) Tankside additions and replacement recommendations are provided on the SUMMARY REPORT when testing gives a value that is outside of the optimum operating range for the hydraulic fluid. A recommendation for an addition to the hydraulic fluid is made as a TANKSIDE ADDITION PER 100 GALLONS OF SYSTEM VOLUME. This is only a recommendation of what could be done to prolong the useful life of the hydraulic fluid.
8) The American Chemical Technologies CHECK-MATE REPORT LEGEND provides general standard testing conditions and general recommendations that would apply to all samples.