ELECTRONICS....HYDRAULICS....HEAT TRANSFER....LUBRICATION

NUCLEONICS....SONICS....COOLANTS....DIELECTRICS:

*Monsanto Specialized Fluids and new FluiDesign Service can help you benefit from*

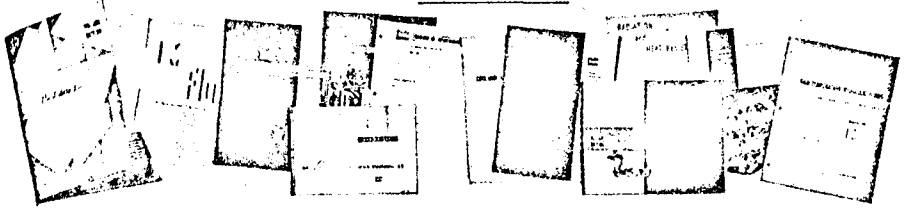
# A RENAISSANCE IN ENGINEERING DESIGNS

Conventional fluids (water, oil) impose well-known restrictions on engineering designs. Heat, radiation, fire hazard, shear, electrical requirements, extreme pressure, friction—all cause problems—limit you in design flexibility, in imaginative thinking, in new ideas.

Monsanto's specialized synthetic fluids—chemically tailored to minimize many design restrictions in power transmission, lubrication, heat transfer, insulation, cooling—make new and improved designs practical. Spawned by advances in specialized fluid properties and broadening of fluid functions—a renaissance in engineering concepts is starting now. These specialized fluids open new design opportunities for your exploration.

Monsanto's new FluiDesign Service—established to help you meet your needs best from the capabilities of some thirty specialized fluids—can give you valuable guidance at the outset of your design exploration and engineering planning. For example, the next two pages provide you with the FluiDesign Service Report, "Dielectric Fluids for New *Electrical* and *Electronic* Uses." Among the twelve fluids described, one or more may allow you to engineer your next design for better performance, less weight, smaller size, or lower cost.

*Be sure to get your fact-packed Fluid Data File...*



0508965

TOWOLDMON0048056
WATER_PCB-00035275

*From Monsanto FluiDesign Service...*

# DIELECTRIC FLUIDS FOR NEW ELECTRICAL AND ELECTRONIC USES

Monsanto can supply you with a series of dielectric liquids that offer the optimum combination of properties for liquid cooling and insulation. Many of the fluids described below are now used commercially in capacitors, transformers, "miniaturized" electronic packages, cables, amplifiers, solenoids, thermostats, computers, and circuit breakers.

*Examples:*

**A.** In electrical equipment such as transformers, Monsanto's askarel-type fluids offer a series of *fire-resistant* dielectrics. These fluids make a firesafe liquid-fill insulation for equipment that then may be located in operating areas without special precaution or costly shielding.

**B.** As impregnants for premium-quality capacitors, high dielectric Monsanto fluids permit a substantial decrease in capacitor size—about 50-60%—compared to oil-impregnated

| Dielectric Fluids | OS-59 | Coolanol® 35 | Coolanol 45 | Aroclor® 1221 | Aroclor 1232 |
|---|---|---|---|---|---|
| *Properties* | | | | | |
| Dielectric Strength, 25°C, 60 cps, 0.1 | 44KV | 47KV | 27KV | 35KV | 35KV |
| Dielectric Constant, 25°C, 1000 cps | 2.46 ($10^6$cps) | .... | 2.2 ($10^6$cps) | 4.5 | 5.4 |
| Volume Resistivity, ohm-cm, 25°C | $6.7 \times 10^{13}$ | .... | $9 \times 10^{10}$ | $>5 \times 10^{12}$ | $>5 \times 10^{12}$ |
| Power Factor, % 1000 cps, 25°C | 0.006 ($10^6$cps) | .... | 0.4 ($10^6$cps) | <0.1 | <0.1 |
| Viscosity, CS | | | | | |
| −65°F | 1380 | 934 | 2400 | .... | .... |
| 100°F | 6.8 | 6.5 | 12.2 | 4.6 | 6.9 |
| 210°F | 2.2 | 2.2 | 3.95 | <1.8 | <1.8 |
| Pour Point, °F | <−85 | <−85 | <−85 | 34 | −32 |
| Boiling Point, °F 760 mm. Hg | >700 | >600 | >700 | 527 | 554 |
| Fire Point, °F Cleveland Open Cup | 435 | 430 | 430 | 349 | 460 |
| Thermal Conductivity Btu/hr/ft/ft²/°F | 0.077 | 0.079 | 0.080 | 0.067 | 0.063 |
| Specific Gravity @25°/25°C | 0.88 | 0.89 | 0.89 | 1.18 | 1.26 |
| Coefficient Thermal Expansion, per °F | 0.00046 | 0.00047 | 0.00048 | 0.00039 | 0.00040 |

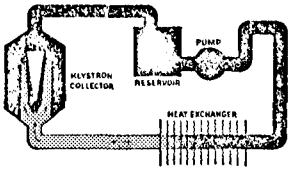
0508966

60-OMC-2766 Electronics, Week of November 14; Machine Design, November 24, 1960 and January 5, 1961

TOWOLDMON0048057
WATER_PCB-00035276

capacitors. Because their dielectric constants are closer to those from the capacitor paper itself, they help achieve a more evenly distributed dielectric stress than is possible with mineral oil.

C. Monsanto's coolant-dielectrics dissipate heat and operate liquid-cooled power packs, magnetrons, traveling wave tubes, klystrons with precise temperature control. Liquid cooling with these dielectrics permits miniaturization of electronic components, conserves size and weight. These special synthetic fluids are

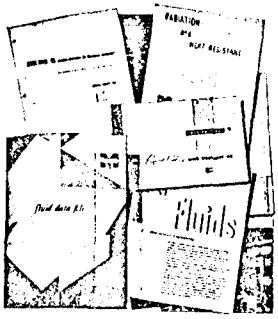



also lubricants, and the single fluid can double as the hydraulic-fluid activator for tuning mechanisms as well as the coolant for the electronic unit.

This schematic circuit (at left) shows how Coolanol 45 liquid cools a klystron. Pumped around the collector, Coolanol 45 absorbs surface heat from the tube wall and carries it away for dissipation in the heat exchanger.

Check the fluids shown for application in equipment you are using or developing. Monsanto can supply you with a dielectric fluid for virtually any electrical or electronic application, can be most helpful in guiding you in the early design stages of equipment that will require a liquid dielectric.

A sample of the fluids shown will be sent to you for evaluation on request. Please specify the particular fluid that interests you and state the nature of the application so that pertinent details can be sent you. For further information on available fluids, request a copy of FluiDesign Service's FLUID DATA FILE.




Simply write on your company letterhead.

Monsanto

Monsanto Chemical Company
Organic Chemicals Division
FluiDesign Service, Dept. 2766C
St. Louis 66, Missouri

| | Aroclor 1242 | Aroclor 1248 | Aroclor 1254 | Aroclor 1260 | Biphenyl | HB-40 | Santowax® R |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | 35KV | 35KV | 35KV | 35KV | 35KV | 35KV | 35KV |
| | 5.8 | 5.6 | 5.0 | 5.0 | 2.5 | 2.65 | 2.58 |
| | $>5x10^{12}$ | $>5x10^{12}$ | $>5x10^{12}$ | $>5x10^{12}$ | $>1x10^{12}$ | $>5x10^{13}$ | $>1x10^{13}$ |
| | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | ....<br>17.2<br>2.5 | ....<br>45.3<br>3.2 | ....<br>46.4<br>6.14 | ....<br>....<br>75 | ....<br>....<br>0.98 | ....<br>29<br>3.9 | ....<br>....<br>.... |
| | 2 | 20 | 50 | 88 | 156 | −13 | 293 |
| | 617 | 644 | 689 | 714 | 491 | 683 | 687 |
| | >610 | >640 | >662 | 698 | 255 | 385 | 460 |
| | 0.058 | 0.057 | 0.054 | 0.051 | 0.076 | 0.072 | 0.063 |
| | 1.38 | 1.45 | 1.54 | 1.62 | 0.984 | 1.002 | 0.955 |
| | 0.00038 | 0.00039 | 0.00037 | 0.00037 | 0.00050 | 0.00041 | 0.00052 |

0508967

oducts Engineering, November 21 and December 26; Electrical Manufacturing, November and December, 1960.

TOWOLDMON0048058
WATER_PCB-00035277