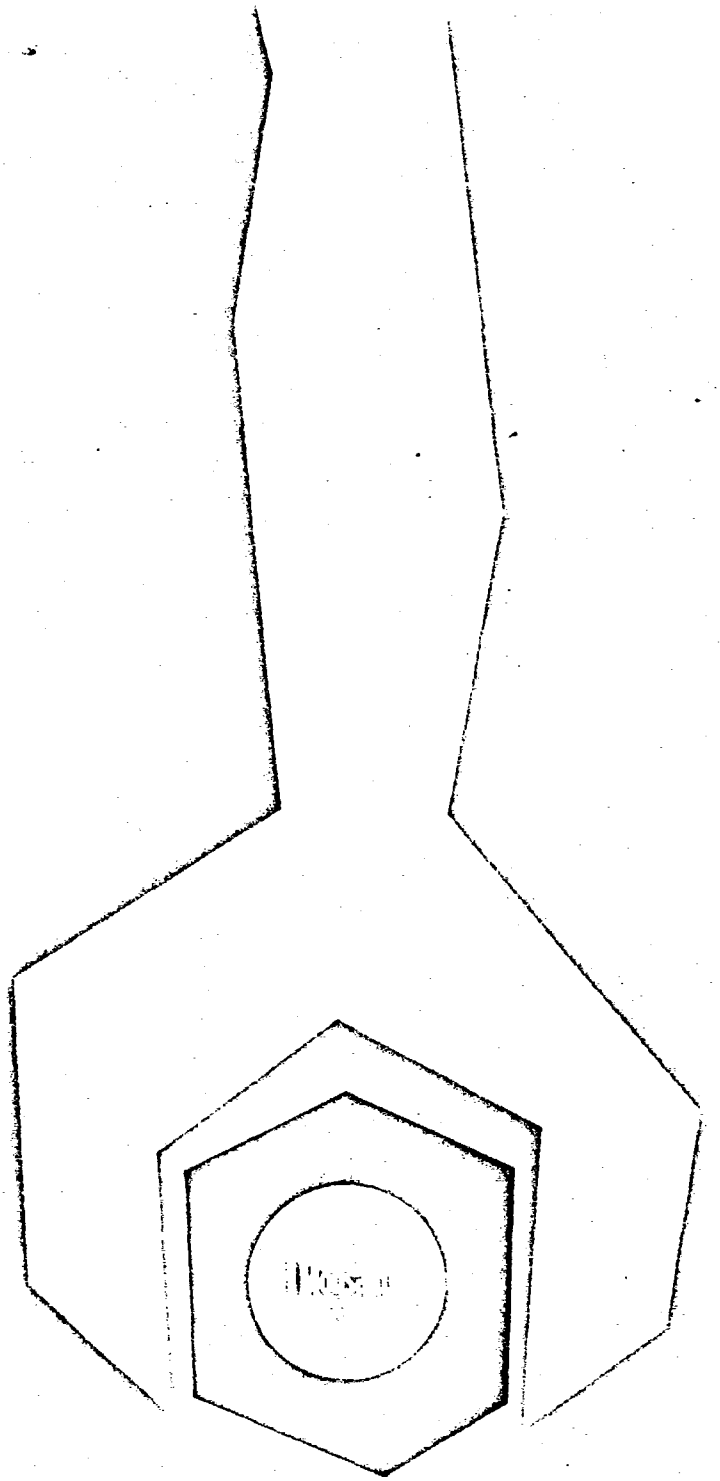


PREVENTIVE MAINTENANCE

a new concept for the hydraulic industry

Pydraul* straight synthetics do more than SAFEGUARD your hydraulic operation—they are PREVENTIVE MAINTENANCE fluids that will give the greatest reliability in operation ... and eliminate your major maintenance and down-time costs if you are now using a water-based fluid.

DSW 321741

STLCOPCB4073392

Include Pydraul straight synthetics in your PREVENTIVE MAINTENANCE program

Preventive maintenance makes sense!

Preventive maintenance is your weapon against down-time, the number one enemy of production. In hydraulics, preventive maintenance usually means routine changing of pumps and filters and tightening valves to cut down leaks. In fire-resistant hydraulic operations, there's another often overlooked factor —the fluid itself.

Pydraul straight synthetics protect your plant, equipment and personnel against fire hazards in hydraulic equipment. So important is this safety aspect that some military contracts now given to die casters go only to those firms using a fire-resistant fluid so that equipment fires cannot hamper delivery of essential parts.

But Pydraul fluids do more than provide fire safety. *Pydraul straight synthetics have built-in "preventive maintenance" — they eliminate the major maintenance troubles of fire-resistant fluids that contain water.*

If you are now considering using a fire-resistant fluid, it will pay you to select a Pydraul fluid. Pydraul fluids deliver the safety you need PLUS the performance you have a right to expect.

DSW 321742

STLCOPCB4073393

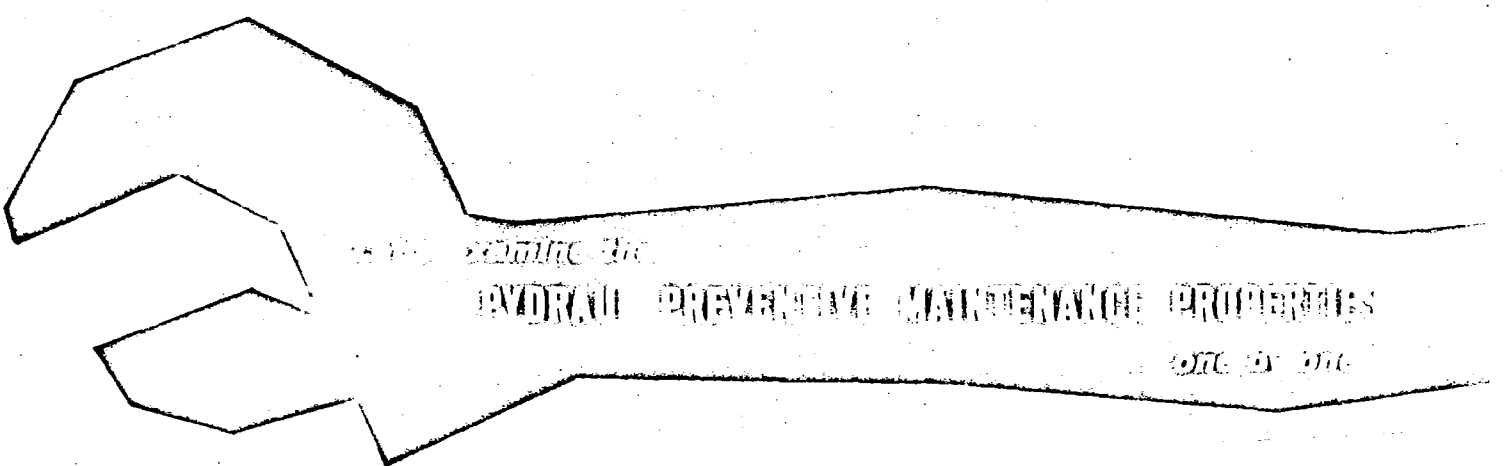
Pydraul straight synthetics exceed water-glycol fluids in the properties that count most in preventive maintenance.

	PYDRAUL	WATER-GLYCOL FLUID
Lubricity under heavy loads	E	P
Oxidative stability	E	P
Thermal stability	E	P
Foaming resistance	E	P
Vapor pressure	Very low	High
Oil compatibility	E	P

Here's why...

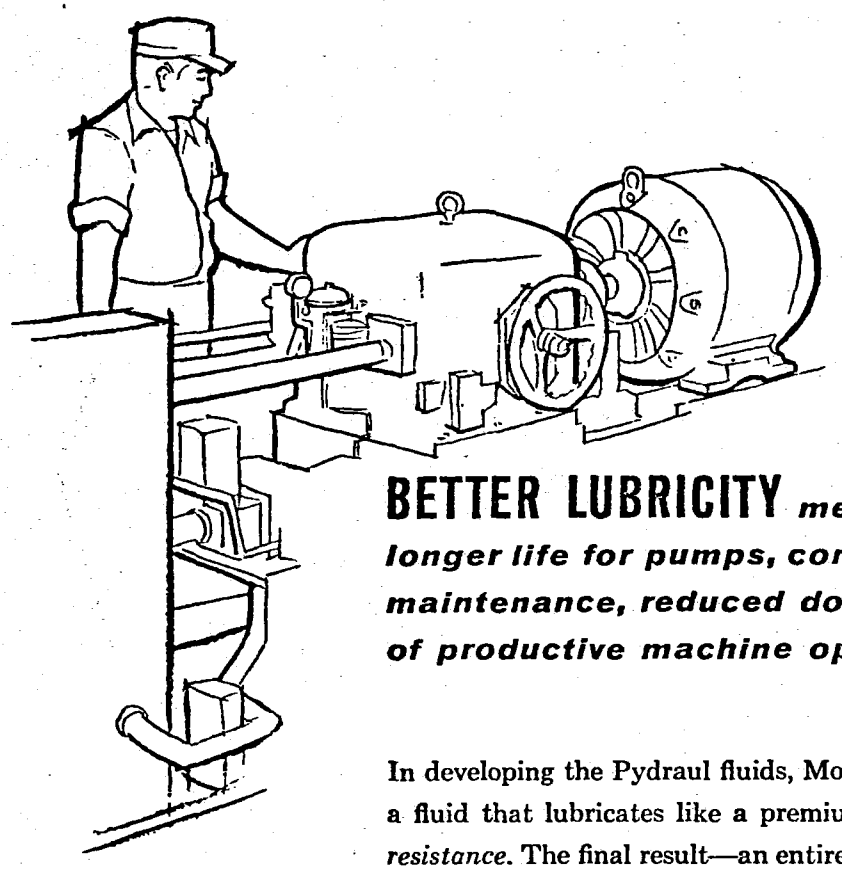
Pydraul fire-resistant hydraulic fluids are chemically synthesized—tailored to the job—not just mixtures of flammable lubricant with water and additives. You can blame the failure of all water-based products to match Pydraul performance on the water. It's the water that causes corrosion and rust. It's the water that evaporates to upset the additive balance and create high vapor pressures and cavitation in pumps. It's the water that causes high wear and replacement of pumps through inadequate lubrication.

But without the water, the water-based fluids would *not be fire resistant!* So you can't escape the consequences.. With water-based fluids, you pay for this type of fire resistance many times over in maintenance costs and lost production in down-time incidents.



DSW 321743

STLCOPCB4073394



BETTER LUBRICITY *means less wear on parts, longer life for pumps, components...reduced system maintenance, reduced down-time and more hours of productive machine operation.*

In developing the Pydraul fluids, Monsanto chemists had just one goal: Find a fluid that lubricates like a premium petroleum oil . . . with inherent *fire resistance*. The final result—an entire series of fire-resistant fluids that do just that . . . lubricate like oil. In over 500,000,000 machine hours of industrial service, Pydraul fluids have earned a reputation as dependable lubricants. Manufacturers of pumps and other equipment have confirmed that Pydraul fluids give reliable service. Manufacturers that refused to issue warranties on 3000 psi pumps for water-based fluids, issued full warranties for pumps on Pydraul.

The test results below show the difference. Pydraul fluids lubricate better than water-glycol fluids and are outstanding under high loads.

	ALMEN WEAR		ALMEN LOAD		TIMKEN LOAD	
	LOSS mg.	LOAD psi	LOAD psi	TORQUE Lbs.	PASSING LOAD Lbs.	FILM STRENGTH psi
Pydraul A-200	1.3	4000	24,000	41	50	16,340
Water-Glycol	2.0	2500	3,000	11	10	5,200

	SHELL 4-BALL WEAR, mm, 630 RPM., 1 HR., 167° F. STEEL-ON-STEEL	
	10 kg.	40 kg.
Pydraul A-200	0.29	0.43
Water-Glycol	0.72	0.91

DSW 321744

STLCOPCB4073395

BETTER THERMAL AND OXIDATIVE STABILITY

means an end to fluid monitoring, corrosion and an extra "cushion" at high temperatures.

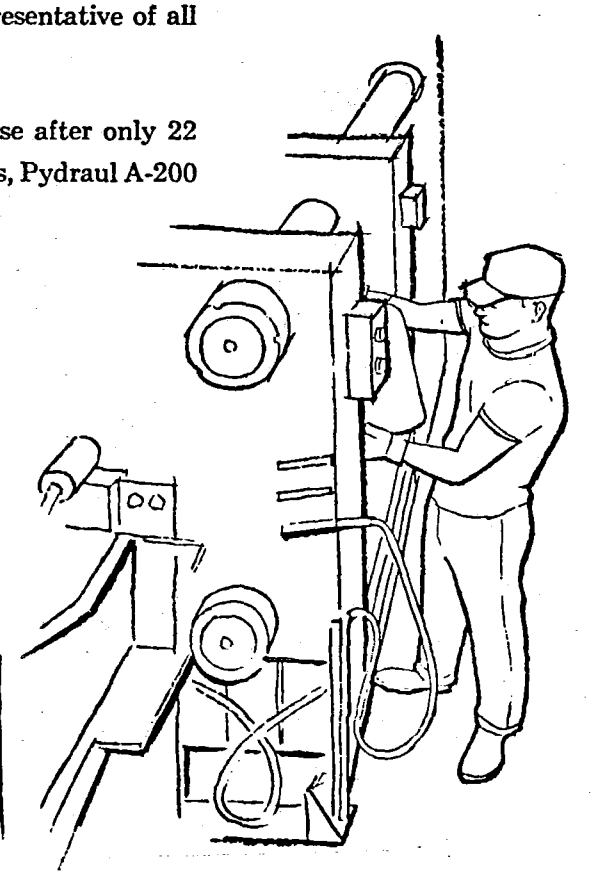
Pydraul fluids stand up exceedingly well under operating temperatures—don't corrode, don't cause rust. In 800,000,000 machine hours of service, *Pydraul has never caused corrosion of any hydraulic system!* Of course, there's no water loss to monitor or additive system to keep in balance.

Pydraul fluids do not react with various metals found in hydraulic systems. Good oxidation stability comes from the fire-resistant nature of Pydraul since burning is simply rapid oxidation.

The following tests were run according to the procedures given in the Military Specification MIL-H-5606A (oil, hydraulic, aircraft, petroleum base). Strips of copper, iron, magnesium, aluminum and cadmium-plated steel were immersed in Pydraul, the fluid heated to 250° F., and held at temperature for 168 hours. Air was bubbled through the fluid to allow oxidation of the metal strips. Though results vary somewhat, Pydraul A-200 is representative of all Pydraul fluids.

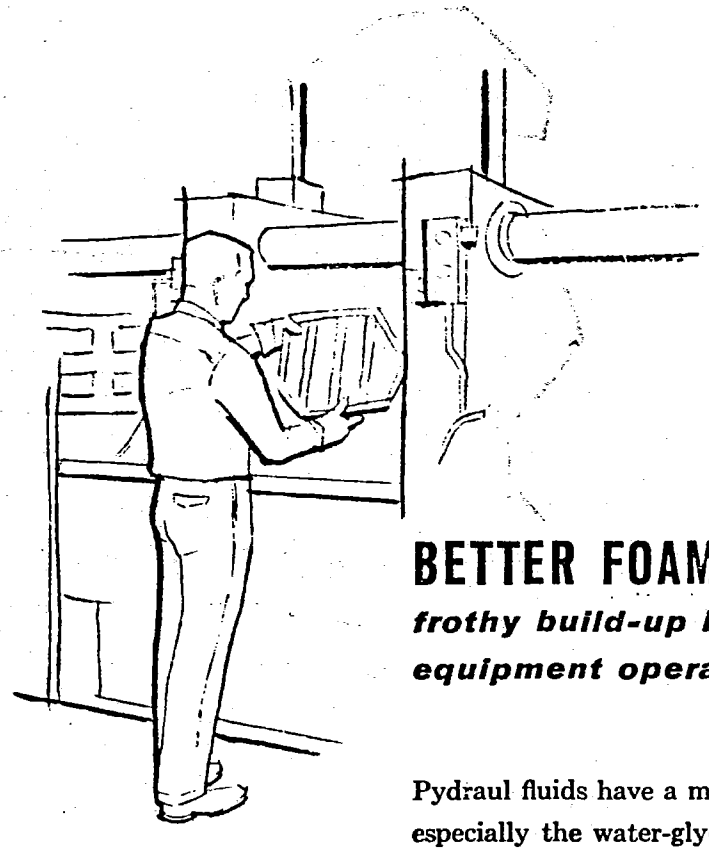
Water-glycol fluid could not be compared in this test because after only 22 hours, 90% of the fluid had evaporated. At the end of 168 hours, Pydraul A-200 showed no appreciable loss—less than 0.5%.

Metal weight change: mg/cm²	PYDRAUL A-200 250° F., 168 HRS.
Copper	−0.05
Magnesium	0
Steel	+0.01
Aluminum	+0.01
Cadmium plate	−0.01
Acidity:	
Initial (total acid)	0.82
Final (total acid)	0.68
Viscosity:	
Initial, 100° F.	30.1
Final, 100° F.	31.8
Initial, 210° F.	2.86
Final, 210° F.	2.93



DSW 321745

STLCOPCB4073396



BETTER FOAMING RESISTANCE *prevents frothy build-up in reservoir and erratic equipment operation*

Pydraul fluids have a much lower foaming tendency than water-based fluids, especially the water-glycol products which are known to cause considerable foam. Excessive foam in the reservoir can easily work its way into the system and cause poor pump operation and erratic response of the hydraulic mechanism. And where excessive foam occurs, you find production timing off.

Pydraul fluids do not cause foaming problems. The figures below show the vast difference in foaming tendency of Pydraul A-200 and a typical water-glycol fluid.

	ASTM FOAM TEST D-892 (ml. at 5 minutes)		
	SAMPLE 1 75° F.	SAMPLE 2 200° F.	SAMPLE FROM No. 2 75° F.
Pydraul A-200	30	8	35
Water-Glycol	250	380	150

DSW 321746

STLCOPCB4073397

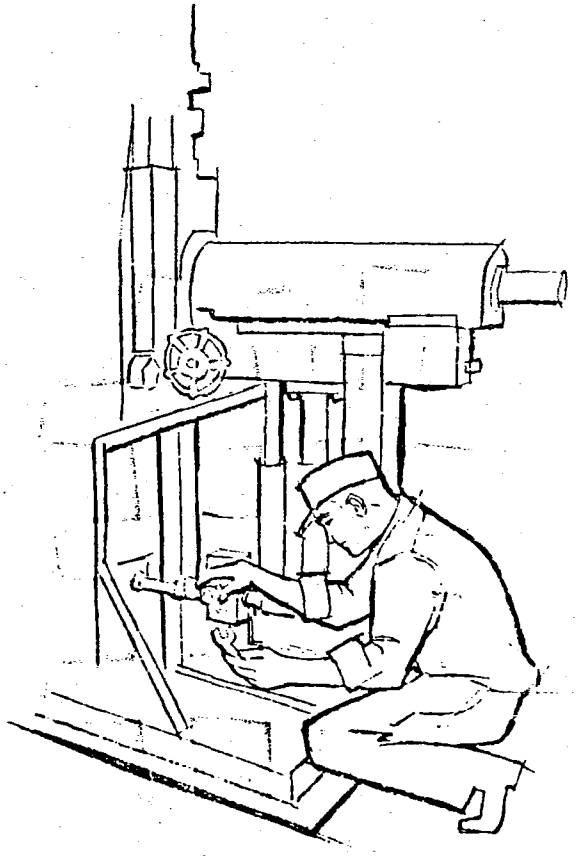
BETTER COMPATIBILITY WITH OIL AND GREASES

prevents sludge formation and clogged filters
if oil or grease enters system

Oils and greases dissolve completely in Pydraul fluids, but added to water-glycol types, they form a sticky mass that can clog filters, block servo orifices or cause sluggish response. If a mechanic overgreases a fitting or adds petroleum oil to the hydraulic system, Pydraul systems don't malfunction. For best service, the oil content should be kept below about seven per cent. Otherwise, fire resistance is lessened and seals and packings may swell. If the content goes above seven per cent, drain off part of the fluid and add fresh Pydraul. The drained fluid can be added gradually as make-up.

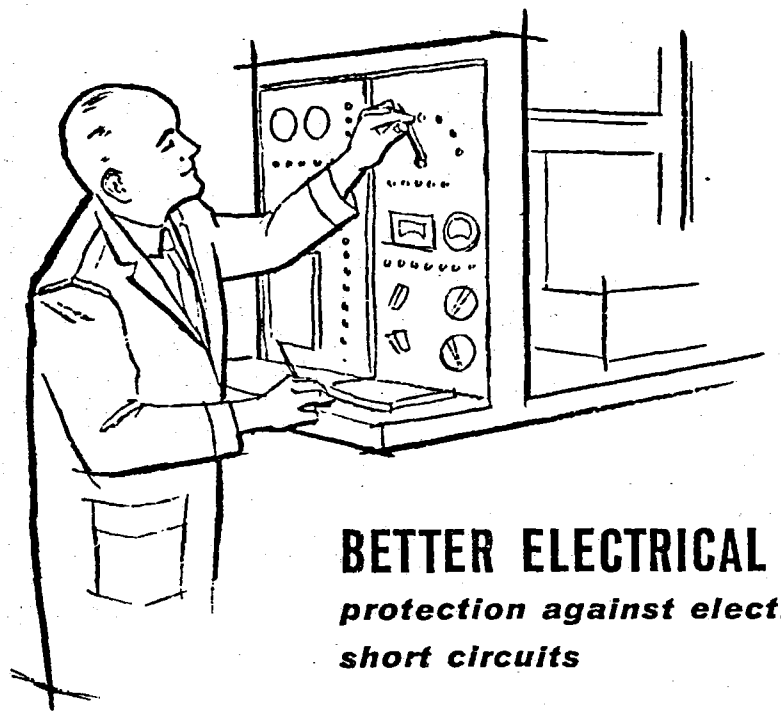
Effect of Oil or Grease on Fire-Resistant Hydraulic Fluids

Pydraul fluids	Oil and grease dissolves completely. Too much content may affect fire resistance and cause swell of packings and seals. Keep below about 7 per cent.
Water-Glycol	Oil and grases insoluble in any percentage. Forms a sticky mass which can clog filters, block servos.
Water-Emulsions	Oil and grease are soluble but can cause the emulsion to break, leaving separate water and oil layers.
Other straight synthetics	Oil and greases not completely soluble. Can form viscous emulsions which starve pumps and bearings, slow down operation.



DSW 321747

STLCOPCB4073398



BETTER ELECTRICAL PROPERTIES *give you protection against electrolytic corrosion, short circuits*

Engineers working in missile hydraulics think this nonelectrolytic feature of Pydraul fluids is important to reliability. When you have electrical panels and numerous switches, electrolytic corrosion can bring trouble. Pydraul fluids themselves are good electrical insulators and protect against short circuits and electrolytic corrosion in the event of line breaks or sprays. In electrical properties, Pydraul fluids compare favorably with transformer fluids.

	PYDRAUL A-200
Dielectric strength at 60 cps, 0.1 in., 25° C.	33 KV
Resistivity, ohm-cm.	
25° C.	0.33 X 10^9
100° C.	0.09 X 10^9

DSW 321748

STLCOPCB4073399

SUMMARY OF YEARLY MAINTENANCE JOBS REPORTED BY ONE INDUSTRIAL FIRM

HERE'S PROOF... of PREVENTIVE MAINTENANCE performance you get with Pydraul.

A large industrial firm operated two die casting machines during a 12-month test period. These machines were identical, located side-by-side, and made the same kind of castings. The only difference was in the fluids used. One machine used a water/glycol fluid, the other used Pydraul. The results below show how Pydraul drastically reduced maintenance jobs that plagued the machine operating on water-glycol fluid. But most important, *the down-time incidents* dropped by an even greater proportion. By eliminating the major maintenance jobs and down-time incidents, the firm was able to increase the production output of the die casting machine and lower maintenance costs at the same time. After this test, the firm converted ALL their die casting machines to Pydraul.

WATER-GLYCOL

PYDRAUL

	MAINTENANCE PERFORMED (DT indicates down-time)	MACHINE #1 WATER-GLYCOL	MACHINE #2 PYDRAUL
	clean filter	41	10
	replace filter	1	0
	remove scum from oil	9	0
	clean compensator	13	1
	adjust compensator	16	3
DT	clean holding valve	1	1
	adjust holding valve	2	1
DT	clean die, open & close valve	1	0
	clean 1000# vol. pump	1	0
	adjust 1000# vol. pump	10	2
	adjust 2000# shot pump	22	4
DT	clean 1000# relief valve	20	1
	adjust 1000# relief valve	21	1
DT	clean 2000# relief valve	16	4
	adjust 2000# relief valve	23	9
	adjust prefill	13	9
DT	rebuild 1000# relief valve	1	0
DT	rebuild 1000# volume pump	3	0
DT	replace rings in 1000# pump	2	0
DT	rebuild 2000# relief valve	2	0
DT	replace seat & piston in holding valve	1	0
	add water, additive	each 6 wks.	0
DT	remove oil, flush & refill	2	0
	Total jobs required	220	41
	Total down-time incidents	49	6

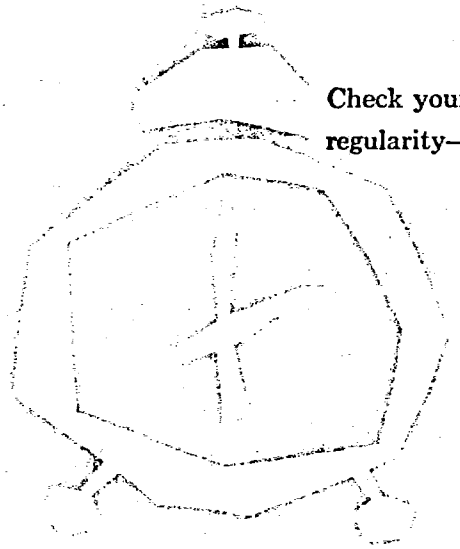
= 10 MAINTENANCE CHECKS

Pydraul PREVENTIVE MAINTENANCE properties

DSW 321749

STLCOPCB4073400

Pydraul straight synthetics can eliminate your major maintenance jobs if you are now using a water-based hydraulic fluid.



Check your maintenance reports. If these jobs are showing up with alarming regularity—

clean, adjust or rebuild relief valves
remove sludgy hydraulic fluid, flush and refill
remove scum from reservoir
clean or adjust compensator
clean sludge from filter
check fluid, add water lost through evaporation
check fluid, add additives lost through depletion

you can put PREVENTIVE MAINTENANCE to work by switching to Pydraul straight synthetics.

In normal hydraulic operations, these jobs should not occur more frequently than two or three times each year. Yet maintenance reports often show they occur twice or more *each month* when water-based fluids are used. If your own reports show these chronic maintenance difficulties, you can solve the problem with Pydraul straight synthetics.

DSW 321750

STLCOPCB4073401

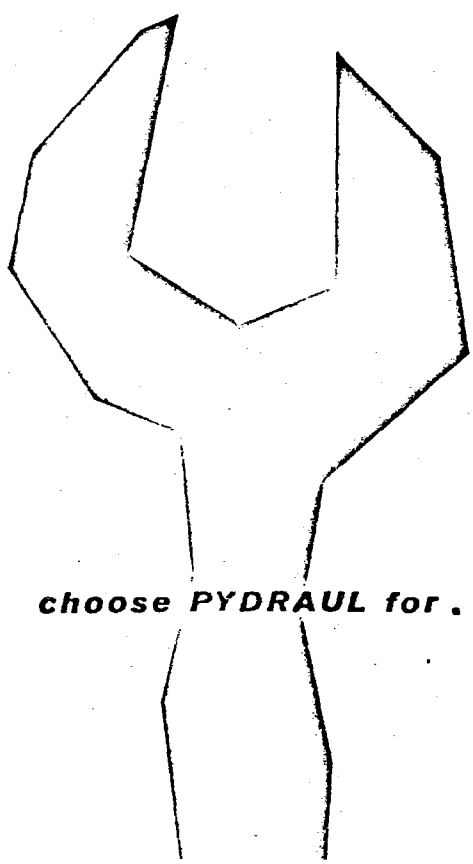
You can count on Pydraul straight synthetics for reliable performance.

In the last eleven years . . . Pydraul fluids have operated over 800,000,000 machine hours. In this time, Pydraul has never caused or contributed to a fire in any type of equipment.

More than 40 industrial plants have converted from water-based fluid to Pydraul for its proven performance advantages.

Users have reported maintenance tasks drop off sharply when they operate on Pydraul.

Pydraul has become the standard industrial fire-resistant hydraulic fluid against which all others are judged, just as Monsanto's Skydrol is the standard of the aircraft industry.



choose PYDRAUL for . . . **SAFETY . . . PERFORMANCE . . . ECONOMY**

DSW 321751

STLCOPCB4073402