



PHILLIPS 66[®] QUENCH OIL PRODUCTS AND THEIR APPLICATIONS

QUENCHING

In the manufacture of high-performance steel parts, heat treatment is used to improve properties such as hardness and strength. Through the controlled heating and cooling of steel through a prescribed range of times at specified temperatures, these properties can be optimized. One of the last steps in heat treating is quenching which is the cooling of the hot part in an oil bath. Proper quenching is important to achieve consistent hardness throughout the part without distortion. Phillips 66 Lubricants manufactures high-quality mineral quench oils developed for heat treatment of iron-based metals in a wide variety of quenching operations.

PHILLIPS 66 QUENCH OILS

A critical property of quench oils is quench speed or rate of cooling. Higher quench speeds generally produce harder parts. Phillips 66 Quench Oils are available in four grades: 15, 22, 22HS and 32HS. The 22 grade is a highly refined, straight (non-additized) paraffinic mineral oil recommended for conventional quenching of ferrous metals at bath temperatures up to 150°F (66°C). It has a slower quench speed than the other grades and provides minimum hardening power.

The other three grades are fortified with select additives to provide enhanced oxidation resistance and metal-wetting ability for use in fast quench operations where it is important to develop maximum hardness while minimizing distortion. The 15 and 22HS grades are high-speed quench oils with moderate-to-high hardening power. The 32HS grade is a higher viscosity, high-speed quench oil that provides the highest hardening power. Quench Oils provide a high initial cooling rate to induce maximum hardness. After the critical transformation temperature is passed, the cooling rate gradually decreases to a much slower rate to minimize the possibility of stress and metal distortion, thereby ensuring a smooth surface finish. These oils are highly stable throughout the hardening temperature range to provide long service life with minimal

sludge formation. They have a high viscosity index for minimum viscosity change during the entire quenching operation and have high flash and fire points to minimize fire hazards.

HOW AND WHERE ARE QUENCH OILS USED?

Quench oils are used in facilities that cast or forge steel parts. They might include agricultural implements such as plow blades; industrial, commercial, or automotive gears; heavy-duty brake parts and many other industry segments. Quench oils are most often a consumable item as some oil is lost due to “dragout”; oil adhering to metal parts after the quench. Quench oils age in service and may lose quench speed. Used oil analysis and quality control data on the hardness of produced parts may be used to assess this. They may then be “sweetened” by removing a portion of deteriorated oil and replacing it with new oil to preserve optimal quench oil properties. Some consumers recycle or recondition deteriorated quench oil by filtration, drying or other means.

QUENCH OIL RECOMMENDATIONS

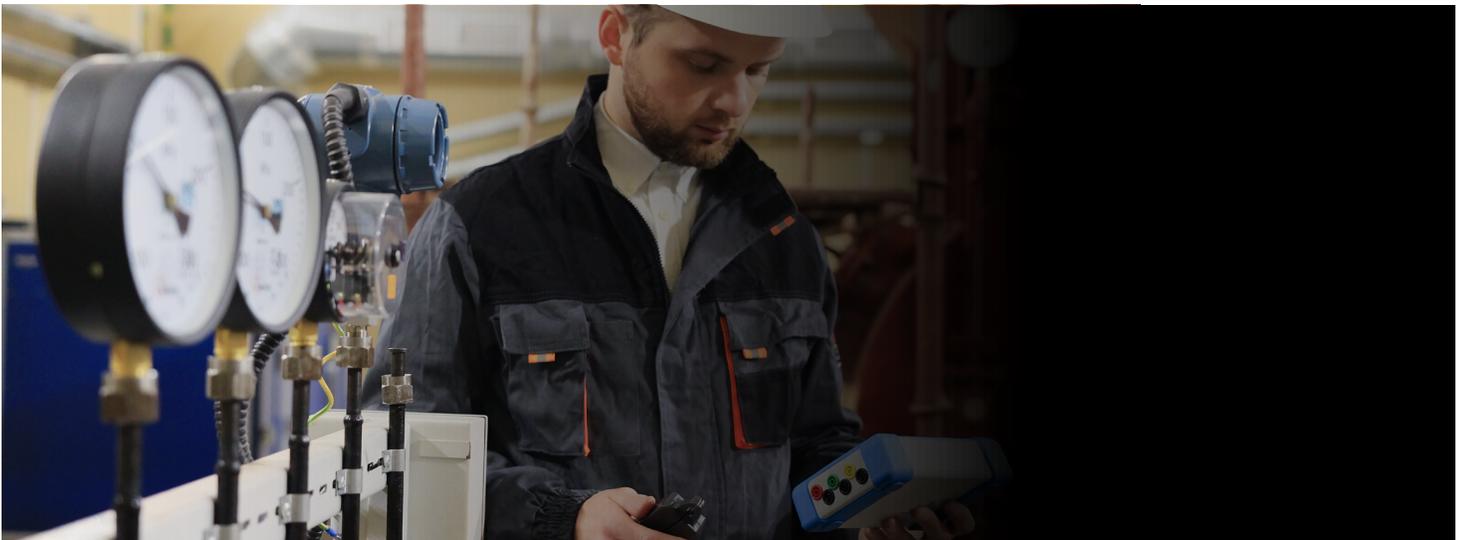
An appropriate product recommendation should be based on a knowledge of the current product in use and its properties and performance in service. A history of used oil analysis of the former product is very helpful. Matching of viscosities, cooling curves (ASTM D6200) and new oil quench speeds (ASTM D-3520) narrows the choices. A simple cross reference is rarely sufficient. Consequently, while transitions between product can be made, once a consumer is satisfied with performance, the barriers to change are higher.

Careful consideration should be given to product compatibility as mixing new and used oils of differing formulations can produce unpredictable quenching performance. The best practice is to drain and refill with new oil.

Consumers are often resistant to this because quench oil system volumes may be quite large, especially in the case of open pit quenching.

OIL ANALYSIS

In addition to the normal service requirements of an industrial consumer, quench oils normally require periodic used oil analysis for condition monitoring. While most of this analysis may be done through conventional oil analysis labs, a cooling curve (ASTM D6200) analysis may be required periodically by the consumer; especially if they currently receive one from their current supplier. These costs can be significant and should be factored into the pricing for the opportunity.



Phillips 66® is a diversified energy manufacturing and logistics company with unique businesses in Lubricants, Refining, Midstream, Chemicals Marketing and Specialties. We reach across every key lubricants market, including automotive, trucking, agriculture, aviation, power generation, mining and construction. Known for high-quality base oils and sophisticated formulations, Phillips 66 Lubricants also offers proprietary research and development facilities, as well as a comprehensive global distribution network.

For more information, call our Technical Hotline at **877.445.9198** | **PHILLIPS66LUBRICANTS.COM**