

## Steel:

## Electric Arc Furnace - Avoiding an Oil Fire Pool

QUINTOLUBRIC® 888-46

### The Challenge

A Thailand steel producer had a fire incident in the Electric Arc Furnace (EAF) process of their long products manufacturing. The fire incident occurred due to metal sparks igniting mineral oil that leaked and accumulated to form a pool. The steel producer was looking for a hydraulic fluid that had a reduced instance of fire propagation and severity compared to mineral oil.

### The Solution

In any steel making process involving heavy equipment and liquid or red hot steel, fire hazards exist when using mineral oil in the hydraulic system. Mineral oil presents a fire risk due to its relative low auto ignition temperature and a low specific heat and high heat of combustion.

Quaker Houghton suggested the steel producer convert to QUINTOLUBRIC® 888-46, HFD-U hydraulic fluid, due to its increased auto ignition point and reduced heat of combustion compared to mineral oil.

### The Product

QUINTOLUBRIC® 888-46 was designed to replace anti-wear, mineral oil-based hydraulic fluids used in applications where fire hazards exist. QUINTOLUBRIC® 888-46 can also be used in environmentally sensitive hydraulic applications without compromising the overall hydraulic system operations. This fluid does not contain water, mineral oil, or phosphate ester, and is based on high-quality, synthetic, organic esters and carefully selected additives to achieve excellent hydraulic fluid performance. QUINTOLUBRIC® 888-46 offers the lubrication level of premium, anti-wear hydraulic oils, and can be used with hydraulic components from all major manufacturers.

### The Benefits

PROPERTY	MINERAL OIL	QUINTOLUBRIC® 888-46 HFD-U	UNIT
Auto Ignition Point	300   572	460   860	°C   °F
Specific Heat	1.7 - 1.8	2.06	J/gK
Heat of Combustion	43	38	KJ/g

The chart above shows:

The auto ignition point indicates when a fluid can self-ignite for mineral oil this point is much lower than that of QUINTOLUBRIC® 888-46, 300°C vs 460°C (572°F vs. 860°F).

Specific heat is the amount of energy needed to heat 1g fluid 1°K. The above shows that you need 10-15% more energy to heat QUINTOLUBRIC® 888-46 compared to mineral oil, making the mineral oil more flammable. In combination with the auto ignition point, this means that it takes exponentially more energy to get the pool temperature over the critical ignition temperature when using QUINTOLUBRIC® 888-46.

The heat of combustion of a mineral oil based hydraulic fluid is typically about 43-44 kJ/g, whereas QUINTOLUBRIC® has a heat of combustion of about 38 kJ/g. Which means burning QUINTOLUBRIC® generates 10- 15% less energy during combustion, making it less likely to propagate.

Combining all the points together, compared to QUINTOLUBRIC® 888-46, mineral oil releases more energy while burning, requires less energy to heat, and has a lower auto-ignition point. Making it possible for the mineral oil to continue to burn and propagate increasing fire hazards in the working environment.

