

## **RUBBER PROCESS OILS**

HPCL's wide range of Rubber Process Oils marketed under the ELASTO brand name cater to all requirements of the rubber industry. ELASTO grades of highly paraffinic, naphthenic, aromatic and extender oils, have found widespread acceptance in the market. The use of ELASTO grades may provide one or more of the following benefits in processing uncured stock :

- Powerful softening
- Minimized scorching
- Improved loading, wetting and dispersion of compounding ingredients.
- Assistance in extrusion moulding, calendering etc.
- Rubber reclamation and extended rubber manufacture.

**ELASTO 165** is highly paraffinic process oil recommended in the manufacture of EPDM rubber and EPDM rubber processing. It imparts excellent weather and wear resistance, to the finished goods. Due to its exceptionally low volatility, losses during compounding are minimized.

**ELASTO 245** is a light colored paraffinic process oil with good color stability. Being a thinner oil than ELASTO 165, it is slightly more volatile. It finds wide usage in butyl and ethylene propylene rubber. It is also recommended for processing light colored goods such as white walled tyres, sporting goods, etc.

**ELASTO 541** is a low viscosity naphthenic oil with fairly good color stability and adequate high temperature properties. Due to its naphthenic nature, it has a better solvency property than paraffinic process oils. It is recommended as a general purpose rubber process oil in the manufacture of tyres, mats, footwear, molded and extruded goods.

**ELASTO 590** is a high viscosity naphthenic process oil with superior volatility and solvency properties than ELASTO 541. However, being a thicker product, compounding has to be carried out at a higher temperature.

**ELASTO 710** is an aromatic process oil with the highest solvency power, among all the ELASTO grades. It is dark in color and is compatible with most rubber polymers. It is widely used in the manufacture of automobile tyres, beltings, battery cases, etc. Where color is not an important factor. It is also recommended for use as a rubber reclaiming oil due to its high solvency.

**ELASTO 715** is also an aromatic process oil with higher viscosity and is specifically developed for use as an extender oil in the manufacture of Styrene Butadiene Rubber (SBR).

<b>TYPICAL PROPERTIES</b>	<b>ELASTO 165</b>	<b>ELASTO 245</b>	<b>ELASTO 541</b>	<b>ELASTO 590</b>	<b>ELASTO 710</b>	<b>ELASTO 715</b>
VISCOSITY KINEMATIC cST	100	33	21	140 @ 54.5 °C	23 @ 100 ° C	45 @ 100 °C
FLASH POINT , COC , ° C	225	190	160	215	220	250
ANILINE POINT ° C	109	98	85	85	40-50	70
POUR POINT, ° C	0	0	0	0	+30	+40

## DRAWMETS

**DRAWMET 15** is a refined lubricating oil blended with fatty oil. The fatty oil gives the wetting ability and helps to improve the finish of the drawn wire. This oil based wire drawing fluid because of its lubricating property improves the life of the die through which the wire is drawn. It also acts as a coolant to carry away the heat generated due to friction and metal deformation which takes place during drawing the wire. The product is stable and does not stain the drawn wire.

Application : The product is used as drawing lubricant in Aluminum Wire Drawing Process and is applied by spray or jet on the dies through which the wire is drawn. It can also be applied by dip method where the dies remain immersed in the lubricant.

### DRAWMET 66

It is a dark color product consisting of a blend of refined high viscosity petroleum oil and a special additive to withstand high temperatures encountered in the die forging operations. It is easily applied by spray

	Drawmet 15	Drawmet 66
Appearance	Clear	Dark
Viscosity @ 40 C, cSt	295	225
Copper strip corrosion @ 100 C for 3 hrs, Max	1	
Density @ 29.5 C (Avg)	0.888	0.925
Flash Point, COC, C, Min	254	182
Saponification No mg KOH/gm	17-21	2-4

### DRAWMET 22 AND DRAWMET 44

These products are so formulated to provide optimum performance in cold drawing of ferrous and non-ferrous metals. They are excellent lubricants for the dies and blank and effectively prevent metal pick up during the drawing operation. They adhere firmly to metal surfaces and are easily removed by usual alkali cleaning methods. They are chemically stable and non-corrosive in behavior.

**DRAWMET 22** is a cream colored compound solid paste containing inert fillers that impart the film strength required in drawing carbon and alloy steels. This product can be suitably diluted with water or mineral oil such as PALEX 100 before application.

**DRAWMET 44** is a cream yellow, sulfur free, water soluble paste for 'dry on' or emulsion application. It is specially balanced mixture of selected soap and fat. Before application this product is normally diluted with water.

#### **APPLICATION :**

DRAWMET 22 can be used as such or diluted suitably with water or mineral oil to meet the specific requirements. It is used for stamping and deep drawing of most metals. It can also be used as drawing compound for carbon steel or difficult non-ferrous metals. The product may be applied by swabbing or brushing with the work before each formation.

DRAWMET 44 is used for wire drawing, tube drawing, deep drawing and similar operations. It is usually mixed with water before use. The metal working operation is performed either by using this emulsion/mixture with water and in some cases of tube drawing the product is used allowing the water in it dry after application to form a residual solid film on the work.

Generally, in copper and brass drawing 5%, 2% and 1% solutions of DRAWMET 44 in water are used for rod reduction, intermediate and fine wire drawing respectively. The solutions are continuously circulated over the dies.

For tube drawing of copper, brass and carbon steel, DRAWMET 44 is used. The solution of DRAWMET 44 in water is continuously circulated over the dies and through the mandrel. The tubes in bundles are dipped in the solution of DRAWMET 44 and dried before drawing.

DRAWMET 44 is used successfully for deep drawing of carbon steel for LPG cylinders. A mixture of one part of DRAWMET 44 and three parts of water is suitable for this severe drawing operations. The mixture is spread on the circular blanks with either an ordinary paint roller or with multiple roller device.

DRAWMET 22 and 44 are used depending upon the properties of the metal or alloy being drawn, severity of the drawing operation, design of the drawing equipment to permit use of oil/water miscible pastes and alkaline wash cleaning treatments for the drawn metal or alloy. The following table gives the typical applications of DRAWMET 22 and 44 for cold drawing of various metals and alloys and the methods for using these drawing compounds for lubrication on the metal forming equipment.

## DRAWMET 22 & DRAWMET 44

### APPLICATIONS

Metal or Alloy drawn	Severity of drawing	Drawing compd.for use	Method of application
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### STAMPING AND FORMING (Cold)

Brass & Copper	Medium Heavy	DRAWMET 44	Dip, swab or spray Dip or swab
Aluminum & Aluminum Alloys	Medium Heavy	DRAWMET 44 DRAWMET 22	Dip, swab or spray Dip or swab
Cupro-Nickel Monel & Inconel	Medium Heavy	DRAWMET 44 DRAWMET 22	Dip, swab or spray Dip or swab
Carbon Steel	Medium Heavy	DRAWMET 44 DRAWMET 22	Dip, swab or spray Dip or swab
Stainless & Alloys Steels	Light	DRAWMET 44	Dip, swab or spray

### WIRE DRAWING

Brass & Copper	General	DRAWMET 44	Circulating pump
Cupro-Neckel Alloys	General	DRAWMET 22	Ciurculating pump
Carbon Steel	General	DRAWMET 44	Circulating pump
Stainless & Alloys Steels	General	DRAWMET 22	Circulating pump

Metal or Alloy drawn	Severity of drawing	Drawing compd.for use	Method of application
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## **TUBE DRAWING**

Brass & Copper	Medium	DRAWMET 44	Circulating pump or dip tubes and dry before drawing
Cupro-Nickel Alloys	General	DRAWMET 22	Swab or circulating pump
Carbon Steel	Light	DRAWMET 44	Dip tubes and dry before drawing
	Medium	DRAWMET 22	Circulating pump
Stainless & Alloys Steel	Medium	DRAWMET 22	Circulating pump

## **TUBE BENDING (Cold)**

Brass & Copper	Medium	DRAWMET 44	Dip, swab or spray
Alloys Steel & Aluminum	Medium	DRAWMET 22	Dip or swab

## **DRAWMET 44**

### **GENERAL RECOMMENDATIONS FOR COPPER DRAWING**

#### **FOR COARSE DRAWING**

Red stock to about 0.10" diameter (i.e. AWG 00 or heavier to AWG 10). Use 13 to 15% DRAWMET 44 in water.

#### **FOR INTERMEDIATE DRAWING**

About 0.15" to about 0.04" diameter (i.e. AWG 6 to AWG 18). Use about 8% DRAWMET 44 in water.

## FOR FINE DRAWING

About 0.05 to 0.01" or finer (i.e. AWG 16 to AWG 30 or finer) use 3 to 5% DRAWMET 44 in water.

Above refers to average drawing conditions i.e. 3000 - 5000 ft. Per minute drawing speeds on final wire.

For lower or higher speeds, concentration of DRAWMET 44 should be increased or decreased as needed to obtain satisfactory surface finish.

For overlapping drawings ranges, use DRAWMET 44 content favoring the heavier operation.

I.e. when drawing from 0.13" to 0.02" use 7 - 8% DRAWMET 44 in water.

## A TYPICAL OPERATION

0.365" red stock to 0.04" diameter - 13% DRAWMET 44 in water

0.13" to 0.02" wire - 6% DRAWMET 44 in water.

## **HP HOT ROLLING OIL**

### **DESCRIPTION**

HP Hot Rolling Oil is a premium quality rolling oil to be used in hot rolling of steel sheets and sections. The product is derived from highly refined mineral oils blended with selected additives to ensure superiority in the following qualities :

- \* Excellent chemical, thermal and oxidation stability.
- \* Excellent dispersancy for uniform roll pass lubrication.
- \* Good emulsibility and antiwear properties.
- \* No smoke or fog in use.
- \* No objectionable odor.
- \* Good plate out characteristics.

### **PERFORMANCE BENEFITS**

Use of HP Hot Rolling Oil give the following benefits :

- Rolling loads are reduced in production mills.
- Co-efficient of friction values are reduced.
- Rolling mill power or torque is reduced.
- Roll life is increased.
- Product tonnage is increased as a result of decrease in the number of roll changes.
- Final material surface finish is improved as a result of decreased surface friction during hot rolling.
- Shape control is improved i.e. there is a decrease in gauge variation.
- Scale control is improved i.e. rolled in and final scale is reduced.

### **APPLICATION**

HP Hot Rolling Oil is recommended for use in steel hot rollings. The Hot Rolling Oil is mixed with the water in a mixing tank in the proportion of 1%-15% by volume and continuously stirred with the help of an electric stirrer. The mixture spread on the roll passes through the spray nozzles.



**PRODUCT SPECIFICATIONS :**

1. Specific Gravity at 15.6.°C.	: 0.92
2. Kinematic Viscosity at 100. °C.	: 12 to 16
3. Pour Point,. °C.	: 0
4. Flash Point, COC,. °C.	: 210.
5. Zinc, % by Wt.	: 0.1
6. Saponification Value, mg KOH/gm	: 90
7. Free Fatty Acid (as oleic acid), %	: 3

## **TRIMOL 225**

In today's emerging scenario, Metal Working Industry is showing increasing preference to low viscosity Metal Working Products. Low viscosity products offer better lubrication, penetration, effective cooling and chip flushing ability, leading to improved surface finish and tool life. They also form thinner films on the work piece, leading to less carry over of oil. Therefore, consumption of the product is less. They are however expected to possess similar load carrying and EP properties as compared to conventional medium viscosity metal working lubricants.

TRIMOL 225, is a new generation metal working product which combines all the above features effectively. It is specially designed to give optimum performance and immense cost benefit to Industry. It is formulated with a low viscosity refined mineral oil blended with a superior film forming agent. It is additionally fortified with a chlorinated Extreme Pressure additive to provide adequate EP properties. TRIMOL 225 is recommended for all machining operations of low to moderate severity as well as high speed operations. It is also recommended for honing and other super finishing operations. It is characterized by its red color and pleasant odor.

### **TYPICAL PROPERTIES**

APPEARANCE	RED
FLASH POINT, COC, °C.	95
EP VALUE, (4 BALL TEST) OK LOAD, KG. WELD LOAD, KG.	250 270
KINEMATIC VISCOSITY AT 40 °C. CST	4.5
COPPER STRIP CORROSION 3 HRS. @ 100 °C.	1

## **CUTTING FLUIDS**

Metal Working Industry has made great strides in introducing new technology in recent years. HPCL's range of cutting fluids have kept up with the changes in technology by way of constant quality upgradation and development of new products to meet specific needs. HPCL's wide range of cutting fluids today cater to virtually every single application in the metal working industry. Classified as water mix type and straight type of cutting fluids, these products are marketed mainly under the brand names of KOOLKUT and TRIMOFIN, respectively. Special products are also sold for specific applications under different brand names.

### **WATER MIX TYPE OF CUTTING FLUIDS :**

HPCL's KOOLKUT series of water mix cutting fluids enjoy leadership status in the market. These products are formulated with refined base stocks and specially selected additives, raw materials, bactericides and other performance chemicals to ensure excellent performance in the shop floor. Diluted in water, at concentrations ranging between 2 to 10%, these products provide excellent cooling, mild lubricity, rust prevention and plating out characteristics.

**KOOLKUT 30** is a general purpose low cost emulsifiable type of cutting fluid suitable for all machining operations where emulsifiable oils are used. Depending on operating conditions oil concentration may be varied between 3 to 10%.

**KOOLKUT 40** is a premium quality emulsifiable cutting oil meeting BIS specification 1115 - 1986. It is recommended for all machining operations requiring emulsifiable fluids and offers excellent cooling and rust protection.

**KOOLKUT 60** is a special grade of premium quality soluble cutting oil. It is specifically recommended in applications where sight of the work piece is important as it forms a translucent emulsion. It is particularly recommended in very demanding applications involving very strict tolerance limits and surface finish. It meets BIS specification 1611-1980. Oil concentration may be varied between 3 to 10%.

**KOOLKUT EP 66** is a premium quality heavy duty soluble cutting oil possessing excellent Extreme Pressure properties. It is recommended in machining operations requiring soluble oils but where severity of machining is more. It is much more effective in extending tool life when compared to other soluble cutting oils. Oil concentration may be varied between 5 to 10%.

PROPERTIES	KOOLKUT			
	30	40	60	EP 66
EMULSION TEST	OFF WHITE EMULSION	MILKY EMULSION	TRANSLUCENT EMULSION	SLIGHT YELLOW EMULSION
LOW TEMPERATURE STABILITY TEST	PASS	PASS	PASS	PASS
EP VALUE ( SHELL 4 BALL ) OK LOAD , KG				180

## SEMI SYNTHETIC FLUIDS

**KOOLKUT 70** is a synthetic fluid which contains no oil. It is supplied as a concentrate containing special corrosion protection additives dispersed in water. When diluted in water in 2-5% concentration, the solution obtained provides exceptional cooling and adequate rust prevention properties. KOOLKUT 70 is recommended for grinding and other high speed machining operations.

**SYNTHKOOL 100** is a premium quality semi-synthetic cutting fluid developed to combine the qualities of both oil based and synthetic water mix fluids. The product is formulated with an assortment of various components to provide cooling, antirust, lubricity, detergency and other properties. It is recommended for high precision grinding and other high speed machining applications. It is also recommended as a replacement to emulsifiable cutting oils in modern machinery.

ALL HP GRADES OF WATER MIX FLUIDS ARE FORTIFIED WITH SUITABLE BACTERICIDES. As such, all KOOLKUT grades and SYNTHKOOL 100 are exceptionally resistant to bacterial growth and provide long service. However, it is essential to maintain good plant handling practices as given below to obtain the longest possible life from these products :

- Pre-treatment of water and its softening for use emulsion/solution preparation.
- The product should always be added to water and not vice-versa. If water is added to product emulsification is not achieved fully and performance is poor, in addition to accelerated bacterial growth.
- Aeration of emulsion/solution to arrest the growth of the predominating anaerobic bacteria.
- Frequent removal of metal chips and fines with proper filtration.
- Regular cleaning of the Coolant reservoir and system.

CHARACTERSTICS	KOOLKUT 70	SYNTHKOOL 100
COLOR	FLOURESCENT GREENISH YELLOW	FLOURESCENT YELLOW
COPPER STRIP CORROSION 3 HRS, 100 ° C, MAX	1	1
NON VOLATILES WT % , MIN	35	38
pH OF 1 :50 SOLUTION IN DISTILLED WATER, MAX	9	8

#### **STRAIGHT CUTTING FLUIDS:**

HPCL's range of straight cutting fluids covers all the available types as follows :

- Fatty Oil Compounded Type
- EP oils, non-staining type, with or without fatty oil compounding.
- EP oils, staining type with or without fatty oil compounding.

These products marketed mainly under the brand name TRIMOFIN are to be used as supplied without any dilution. To obtain optimum performance, the products are to be applied capiously to completely flood the worktool-chip area. By doing so adequate cooling can be provided to the operation, which otherwise is very easily achieved by water mix fluids.

TRIMOFIN grades are formulated from refined base stocks and sulphur based or chlorinated additives to achieve Extreme Pressure (EP) properties. Additionally or otherwise, they are compounded with high quality fatty oils to enhance wetting characteristics and to provide improved lubrication under boundary conditions.

#### **STRAIGHT CUTTING FLUIDS - COMPOUNDED TYPE :**

**TRIMOFIN 14** is a low viscosity oil compounded with high quality fatty oil. It is recommended in the machining of all non-ferrous metals (except titanium). Its low viscosity permits high speed machining. It is non-staining in nature. It is also recommended as a superfinishing/honing oil

**TRIMOFIN 15** is light colored oil with low viscosity , particularly suitable for honing operations, and is useful for machining all non- ferrous metals ( except titanium ) where a low viscosity is required. It has good heat transfer properties and therefore effectively cools the tool and work piece, under high speed conditions at which metals like aluminium, magnesium, zinc and their alloys are machined.

**TRIMOFIN 16 and TRIMOFIN 18** have a higher viscosity than TRIMOFIN 14/15 and have superior wetting characteristics. They are recommended for medium speed, severe machining of non-ferrous metals. TRIMOFIN 18 is a highly compounded oil and is therefore recommended for machining difficult non-ferrous metals such as non-leaded bronze and phosphor bronze. It is also useful as a drawing oil for ferrous and non ferrous metals. It is particularly recommended for drawing of non-ferrous rods and tubing. TRIMOFIN 18 meets BIS Specification 3065-1970 Type I, Grade II.

PROPERTIES	TRIMOFIN			
	14	15	16	18
VISCOSITY KINEMATIC CST @ 40 ° C	5	6	22	22
FLASH PONT COC, ° C	110	110	160	160
COPPER STRIP CORROSION , 3 HRS , MAX @ 100	1	1	1	1
SAPONIFICATION MATTER, WT %	8	8	9.5	20

#### **STRAIGHT CUTTING OILS (EP TYPE NON-STAINING)**

**TRIMOFIN 20** is a light coloured stable product of low viscosity, containing chlorinated EP additives. It is recommended for honing, lapping and other superfinishing operations of ferrous and non-ferrous metals involving high speeds.

**TRIMOFIN 21** is a medium viscosity, light coloured product which is compounded with fatty oil. It also contains chlorinated EP additive. It is recommended as a general purpose cutting oil in multiple operations on ferrous and non-ferrous metals where the machining is of low to moderate severity.

**TRIMOFIN 23** is an oil of higher viscosity than TRIMOFIN 21. It is also compounded with a higher dosage of fatty oil. It also contains sulphurised EP additive. Due to its special formulation it has superior wettability. It is recommended for high speed automatic machine tools and may also be used as a general purpose machine tool lubricant. TRIMOFIN 23 meets BIS Specification 3065-1970 Grade 2, Type 2 and also meets defence ZX-6 requirements.

**TRIMOFIN 25** is an oil similar to TRIMOFIN 23 but with a lower dosage of oiliness additive balanced by sulphurised EP additive. It is specially recommended for multispindle lathes where a number of operations such as turning, honing, chamfering etc. Are performed.

**TRIMOFIN 26** is a medium viscosity fatty oil compounded oil. Additionally it contains both chlorinated and sulphurised EP additives. It is suitable for most operations on medium machinability metals and even severe operations on steels. It is particularly recommended for grade rationalisation in cutting down usage of different grades and substitution by a single grade.

**TRIMOFIN 27** is a low viscosity oil compounded fatty oil. It also contains chlorinated and sulphurised EP additives. Due to its low viscosity it has excellent cooling and chip flushing performance. It finds use in gun drilling operations and has been found to be particularly useful in pull-honing operations. It is particularly recommended for grade rationalisation in cutting down usage of different grades and substitution by a single grade in operations requiring low viscosity oil.

PROPERTIES	TRIMOFIN					
	20	21	23	25	26	27
VISCOSITY KINEMATIC CST @ 40 ° C	5	25	33	35	29	13
FLASH PONT COC, ° C	110	160	160	160	160	145
INACTIVE SULFUR	NO	NO	YES	YES	YES	YES
ACTIVE SULFUR	NO	NO	NO	NO	NO	NO
CHLORINE	YES	YES	NO	NO	YES	YES
SAPONIFICATION MATTER, WT %	-	4.5	9	3	3.5	4.5

## **STRAIGHT CUTTING OILS (EP TYPE - STAINING)**

**TRIMOFIN 54** is a low viscosity fatty oil compounded product which also contains active sulphur type of EP additive. It is specially recommended for deep hole drilling on ferrous metals and precision grinding of all types of steel. It is also used in other severe operations on ferrous metals requiring low viscosity oil. It is also recommended for thread rolling.

**TRIMOFIN 55** is a medium viscosity dark brown coloured fatty Oil compounded oil. It also contains active sulphur and chlorinated EP additives. It is recommended for severe machining operations on high tensile steel and for less severe operations on stainless steel and heat resistant alloys. It is particularly recommended for gear hobbing and threat cutting operations.

**TRIMOFIN 56** is a medium viscosity oil which is highly compounded with fatty oil. It contains a more potent additive package than TRIMOFIN 55 by way of active and inactive sulphur as well as chlorinated EP agents. It is specially recommended in threading, turning, broaching, trepanning and threat grinding operations where it gives excellent finish and improved tool life.

**TRIMOFIN 58** is a dark coloured medium viscosity oil containing a high dosage of Sulphur. It is recommended for heavy duty threading, tapping and broaching operation.

<b>PROPERTIES</b>	<b>TRIMOFIN</b>			
	<b>54</b>	<b>55</b>	<b>56</b>	<b>58</b>
VISCOSITY KINEMATIC CST @ 40 ° C	16	37	38	35
FLASH PONT COC, ° C	135	160	160	160
SAPONIFICATION MATTER, WT %	5	1.5	9	-
INACTIVE SULFUR	YES	NO	YES	NO
ACTIVE SULFUR	YES	YES	YES	YES
CHLORINE	NO	YES	YES	NO



## **RUST PREVENTIVES**

Various protective measures like alloying, plating, painting, etc. are used by Industry to prevent the corrosion of metals. While these measures are of a permanent nature, petroleum based rust preventives find wide applications for temporary corrosion protection during storage and transportation. HP Rustop grades of rust preventives have been selectively formulated for various specific applications and offer the following advantages :

- \* They are non staining
- \* They are compatible with lubricating oils and hence the surface film need not be removed.
- \* They are easily applied by brush, spray or swab.
- \* They are easily removed by solvent.
- \* They are economical.

### **SOLVENT CUTBACK TYPE : RUSTOP 173 & RUSTOP 274**

These products are free flowing liquids consisting of film forming agents, rust inhibitors, water displacing additives and lubricant base stock, carried by a solvent. On evaporation of solvent, a thin, soft film is obtained. Upon application, these products displace all traces of moisture from the surface.

**RUSTOP 173** is a multipurpose rust preventive, which can be used on external and internal surfaces where elaborate rust protection is unnecessary. It is also recommended as an interprocess rust preventive in metal working industry to provide temporary protection for machined parts/assemblies awaiting further machining. The product can be applied by dip, swab or spray method

**RUSTOP 274** is a premium rust preventive oil specially designed to protect all types of bearings and other components which are more prone to corrosion. In addition to water displacing property, it has an additional finger print neutralising property. Due to its superior properties, it can offer protection for extended durations when used undiluted. For interprocess protection, however, it can be diluted with mineral turpentine, to cut costs. It can also be used as a sealant for sophisticated components

PROPERTIES	RUSTOPS	
	<b>173</b>	<b>274</b>
FLASH POINT	32	60
NON VOLATILES WT %	22	-
COPPER STRIP CORROSION , 3 HRS 100 ° C	1	1
FINGER PRINT NEUTRALIZATION TEST	-	PASS
WATER DISPLACEMENT TEST	PASS	PASS
COVERAGR SQ MTS/LIT	145	75

#### **OIL FILM TYPE : RUSTOP 285,286,287**

These are composed of lubricant based stocks with soluble corrosion inhibitors. They are generally applied by dip, spray or circulation. Upon application, they form an oil film on the surface. The film's inherent functions of preventing corrosion is enhanced by the action of the corrosion inhibitors, which are bonded on the surface by wetting agents.

These grades are recommended for most oil type applications including interiors of machine during storage, standby or transportation . Rustop 285 and 286 are recommended for the protection of hydraulic systems or IC engine interiors. Depending on the viscosity of the final lubricant to be used in the machine , the corresponding RUSTOP grade can be selected. These are usually applied by circulating product through the machine by operating the machine briefly. When the oil is drained , the internal surfaces are fully protected against the rust by the oil film which has formed . Subsequent removal of the film is seldom necessary. Rustop 286 corresponds to the SAE 40 type of oil

RUSTOP 287 is a viscous product and leaves a thick film on the surface. It is usually used where cold dip method is preferred for obtaining a thick film of rust preventive.

PROPERTIES	RUSTOPS		
	285	286	287
VISCOSITY KIN. @ 40 ° C	29	170	262
FLASH POINT	190	190	216
COPPER STRIP CORROSION , 3 HRS 100 ° C	1	1	1
SAP VALUE mg/KOH/gm	6	4.5	5
COVERAGE SQ MTS/LIT	25	10	12

#### **GREASY FILM TYPE : RUSTOP 387,388**

These products are soft waxy solids at room temperatures. They are formulated with lubricant base stocks , waxes , corrosion inhibitors and film forming agents. These products are to be heated to about 70-75 prior to application . The rust preventive film obtained by hot dip, swab or brush with these grades, is soft ,greasy and semi transparent. This type of rust preventive is resistant to abrasion and to a considerable extent has a self healing ability. In the course of time , the exterior of the film may form a crust while the interior remains soft and plastic . If the film is ruptured, the soft inner layer tends to reform over the break to restore protection. The film is compatible with conventional lubricants. I f required , the film is easily removed with solvent such as mineral turpentine .

RUSTOP 387 is a grade of intermediate hardness with better rust prevention properties than RUSTOP 388. RUSTOP 387 is suitable for semi sheltered out door exposure and for parts stored indoors under corrosive atmosphere. Rustop 388 is recommended for parts during indoor storage.

PROPERTIES	RUSTOP	
	387	388
APPEARANCE	SEMI SOLID	SEMI-SOLID
CONSISTENCY @ 25 ° C UNWORKED	245	220
COPPER STRIP CORROSION , 3 HRS @ 100 ° C	1	1
HUMIDITY CABINET TEST 720 HRS @ 60 ° C WITH 100 % HUMIDITY	PASS	PASS
COVERAGE SQ MTS/LIT @ 70-80 ° C	15	15
FINGER PRINT NEUTRALIZATION TEST	PASS	PASS

## QUENCHING OILS

In heat treatment process , undertaken by metal working industry, the term quenching refer to the controlled cooling of the steel components in a fluid to give specified properties . Hardness and other properties obtained depend upon the composition of steel, the dimension of the component , time and temperature of heat treatment and the speed and duration of the quenching process. Various quenching media have been used by heat treatment industry during its evolution. However petroleum based quenching oils find the widest applications . Petroleum based quenching oils offer easy process control and impart uniform hardness. They are suitable for large scale automation , are non corrosive and non toxic.

HP quenching oils are marketed under the brand names METAQUENCH . These grades are specially formulated from highly refined petroleum base stocks. Additionally specific grades are fortified with chemical additives or fatty oils . These grades offer the following:

- ⇒ Good Thermal Stability
- ⇒ Good chemical and oxidation stability
- ⇒ High boiling points and low volatility
- ⇒ High flash and fire points

### **METAQUENCH 39,40**

These are blends of highly refined base oils selected for their superior physical & chemical properties. These oils have inbuilt resistance to oxidative, thermal or physical degradation due to the special refining process used in their manufacture. Metaquench 40 is recommended for quenching operation involving large components and higher temperatures. Being a higher viscosity oil with correspondingly higher thermal stability, it gives satisfactory performance with low oil consumption. These grades meet IS 2664 : 1980 Straight Mineral type Grade Medium and Heavy respectively.

### **METAQUENCH 42**

This is a blend of highly refined petroleum base stocks with high quality fatty oils. The heat transfer characteristics of the petroleum base stocks are enhanced by the presence of the high quality fatty oil with its inherent wetting ability. Its quenching speed is higher as compared to Metaquench 39, and Metaquench 40.

Metaquench 42 is recommended for general purpose quenching operations. It is however not recommended for quenching of cyanided parts.

METAQUENCH 42 meet the requirement of IS 2664 -1980 Compounded Type Quenching Oil.

### **METAQUENCH 43**

This is an additive type of quenching oil with good dispersant properties and excellent heat transfer characteristics. The special additive incorporated in this oil controls soiling of the metal parts during quenching by preventing dirt from accumulating on the metal, thus ensuring uniform hardness with minimum quench distortions. It meets the requirement of IS 2664 Additive Type quenching oil.

**METAQUENCH 85** This is a marquenching oil suitable for maintaining the quenching bath at temperatures between 150-220. It is recommended for the mass production of high precision, high quality products such as bearing races, automotive gears and transmissions components. It gives low and predictable quench distortions cutting down rejects.

PROPERTIES	METAQUENCH				
	39	40	42	43	85
VISCOSITY KINEMATIC , cST @ 40 ° C	28	62	28	28	16 at 100°C
VISCOSITY INDEX	90	90	90	90	90
FLASH POINT , COC, ° C	190	220	175	175	240
NEUT NO mg/KOH/ gm	0.1	0.1	1.3	0.6	0.1
COPPER STRIP CORROSION, 3 HRS @ 100 ° C	1	1	1	1	1
GM QUENCHOMETER READING , SECS	27.9	29.0	24.1	20.6	34.6

## MAINTENANCE OF QUENCHING OILS

With proper care and maintenance , HP Quenching oils can give trouble free and satisfactory service for very long periods. Special emphasis must be laid on condition monitoring of quenching oil in the laboratory . With proper condition monitoring and interpretation of lab results, suitable action can be initiated to derive the maximum possible benefits and life from quenching oils

In addition to the condition monitoring , quenching system design and maintenance play a major role in extending the life and enhancing the performance of quenching oils. A few essential details are to be kept in mind during system and maintenance are given below:

- Circulation of the oil and/or movement of components being quenched is essential for uniform results

Sufficient quantity of the oil should be present in the bath for the amount of steel being quenched to minimize oil losses

It is important to maintain the oil at a nearly constant temperature to limit loss of oil over long periods of use. Water jacketed tanks and heat exchangers may be employed to maintain the oil temperature

## **THERMIC FLUIDS**

HPCL markets thermic fluids under the brand names of HYTHERM. These specially formulated oils provide excellent performance in a very broad range of applications. These grades are formulated from specially derived petroleum base stocks having exceptional resistance to degradation during high temperature use.

### **HYTHERM 500**

This is a heat transfer oil indigenously developed to provide the finest performance and broadest range of applications in Textile, Chemical, Paint & Varnish and Petrochemical industries. The product is manufactured from petroleum stocks produced by special refining process in which the thermally unstable components are removed. Hytherm 500 is recommended in service involving a maximum bulk temperature of 290°C.

In addition it has the following characteristics.

- Excellent oxidation & chemical stability
- Good heat transfer properties.
- Low volatility
- Non-corrosive and non toxic

### **HYTHERM 600**

This is a superior oil developed for heat transfer systems where bulk operating temperature go up to 310°C. This product is derived from the finest quality petroleum base stocks and is fortified with high performance additives to enhance performance at higher temperatures.

It has the following outstanding features.

- Ability to withstand higher temperature upto 310°C
- Increased life, reduced oxidation and thermal degradation
- Minimal fouling and deposit formation on heat transfer surface. Hence sustained heat transfer characteristics.

Hytherm 600 gives excellent performance in high temperature heat transfer systems. It can even replace synthetic products with a few minor systems modifications and operate satisfactorily subject to the above temperatures limit.

## **FLUSHING/FILLING OF HEAT TRANSFER SYSTEMS**

Heat transfer systems should be flushed before initial start up and at each oil change. Flushing is desirable because deposits within the systems can reduce the rate of heat transfer and cause degradation of the oil.

The necessity of properly cleaning the heat transfer system prior to initial start up and at the time of system oil change can be significant factor in extending the life of heat transfer system operation. Flushing agents used for cleaning should be chosen carefully. Diesel, kerosene and solvents should not be used as flushing fluids.

The flushing oil, when flushing the system, should be heated to approximately 80°C and circulated for sufficient time to completely disperse the deposits. It may be necessary to provide a clean out trap to physically remove the sludge that is deposited in the expansion tank and heating unit. When severe choking is not present, flushing results in satisfactory cleaning. However when severe choking is present, mechanical cleaning may be necessary.

### **HYTHERM**

<b>CHARACTERISTICS</b>	<b>500</b>	<b>600</b>
Viscosity Kin, cSt, @ 40°C	30	33
Flash Point, COC, °C	194	194
Pour Point, °C	0	0
Copper Strip Corrosion 3 hrs @100°C	1	1
Neut.No. mg KOH/gm	0.15	0.15
Specific Heat, K cal/kg°C		
@ 260°C	0.629	0.630
@ 280°C	0.647	0.640
@ 300°C	0.665	0.666
Thermal Conductivity		
Kcal/hr-mt-°C		
@ 260°C	99.7	96.6
@ 280°C	98.4	95.3
@ 300°C	97.2	94.1



