



PRODUCT STANDARD
STEAM TURBINE

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PAGE 1 OF 7

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SUPERSEDES
INVENTORY No.

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**TECHNICAL DELIVERY
SPECIFICATIONS
FOR
FIRE RESISTANT FLUID**

SIGN & DATE	ISE & CPL	VIRENDRA KUMAR	<i>Virendra Kumar</i> 23.10.04	DRAWN	RPS / UKH	<i>RPS</i> 19.6.01
	TSX	KISHAN LAL	<i>Kishan Lal</i> 20/6/01	WORKED	RCA	<i>RCA</i> 19.6.01
	QAX	S. SEHAVAN	<i>S. Sehavan</i>	CHECKED	RCA	<i>RCA</i> 19.6.01
	AGREED DEPTT.	NAME	DATE & SIGN	SUPERVISED	BSS	<i>BSS</i> 19.6.01
INVENTORY No.	REV. NO. 03			APPROVED	K.M. Singhal 20/6/2001 8.20	
	DATE: 21.5.15			ADDL. GENERAL MANAGER	Gr.No	
				F-REPAIRED:	ISSUED:	DATE
				S.T.E-TG	S.T.E-TG	20-6-2001

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1.0 SCOPE:

This specification is applicable for fire resistant fluids, hereafter referred to as FRF, used as a pressure transmitting medium in the turbine control and governing system, electro-hydraulic actuators (compact drives and electro-hydraulic drives) with integrated hydraulic supply (nominal pressure 160 bar). The specification is based on TLV 9012 AUSF 01; 9012 02.

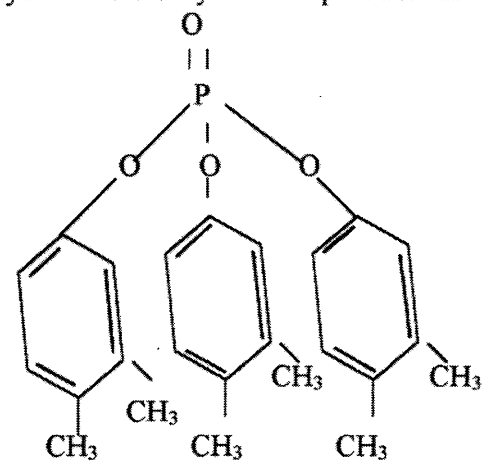
2.0 GENERAL REQUIREMENTS:

2.1 TYPE OF FIRE RESISTANT FLUID:

The FRF shall be Triarylphosphate esters type free from water content. The FRF is designated as HFD according to DIN 51502.

2.2 CHEMICAL COMPOSITION:

The FRF shall be 100% natural Trixylenyl phosphate (TXP), a reaction product of phosphorus oxychloride and xylo. This product has the following chemical formula.



CAS NUMBER 25155 - 23 - 1

The final product must be free of neurotoxic quantities of ortho-cresol-compounds. In order to improve certain properties e.g. corrosion protection, oxidation stability, additives may be included provided they have no negative effect on the materials of the FRF-system or its operation.

2.3 CORROSION PROTECTION:

- (a) The FRF shall not cause corrosion to the following materials:
Steel, Copper, Copper Alloys, Zinc, Tin, Aluminum.
- (b) The FRF must be capable of providing sufficient corrosion protection to the materials used in the FRF-system.
- (c) The FRF will be continuously regenerated with a regeneration agent.
- (d) The FRF must not cause any erosion or corrosion on the edges of the control elements.

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P-5573 17/11/04

SUPERSEDES
INVENTORY No.

2.4 VISCOSITY GROUP:

The FRF shall be of viscosity group ISO VG 46.

2.5 LIFE TIME:

Under the mentioned conditions and with regular regeneration, the FRF must provide a minimum life time of 25000 operating hours without any significant change in its properties. The maximum permissible limit of alteration in parameters during its working life are indicated under clause 2.13.

2.6 SHEAR STABILITY:

The FRF must be shear-stable . It should not contain Viscosity Index (VI) improver.

2.7 FIRE RESISTANCE:

The FRF leaking from the system must not ignite or burn in contact with hot surface (upto 550°C).

2.8 THERMAL STABILITY:

The FRF must be capable for withstanding a continuous temperatures of 75°C without physical or chemical degradation.

2.9 COMPATIBILITY WITH ANOTHER BRAND OF FRF:

The FRF must be miscible with traces (Max. 3% by Volume) of TXP of another brand. There should be no deterioration of the FRF in the presence of such trace quantities.

2.10 COMPATIBILITY WITH PACKING MATERIAL:

The FRF must be compatible with the following packing materials used in the system:

Fluorocarbon rubber (FKM), butyl rubber (IIR), Polytetrafluoroethylene (PTFE), Polyethelene (PE), Polyamide (PA), Di-isocyanate adhesive, Polyurethane / Polyester.

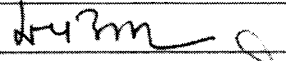
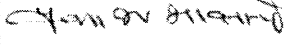
The FRF should not have a negative influence on its air-separation capability in the presence of above packing materials.

2.11 PHYSIOLOGICAL CONSIDERATIONS:

The FRF must not cause a safety or health hazard to the persons working with it provided that normal good industrial hygiene practices are followed.

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PRODUCT STANDARD

STEAM TURBINE

ST22007

Page 4 of 7

SUPERSEDES
INVENTORY No

2.12 PHYSICAL AND CHEMICAL PROPERTIES:

PROPERTY	NUMERICAL VALUE	UNIT	TEST METHOD	
			DIN / ISO	ASTM
Kinematic Viscosity at 40 °C (ISO VG 46)	41.4 - 50.6	mm ² /s	DIN 51 562-1	D 445
Air release at 50 °C	≤ 3	minutes	DIN 51 381	D 3427
Neutralisation number	≤ 0.1	mg KOH/g	DIN 51 558-1	D 974
Water content	≤ 1000	mg/kg	DIN 51 777-3	
Foaming at 25 °C : Tendency	≤ 100 ≤ 450	ml sec		D 892 (Seq.1)
Stability				
Water separability	≤ 300	sec	DIN 51 589-1	
Demulsification	≤ 20	minutes	DIN 51 599	D 1401
Density at 15 °C	≤ 1250	kg/m ³	DIN 51 757	D 1298
Flash point (Cleveland open cup)	> 235	°C	DIN/ISO 2592	D 92
Ignition temperature	> 550	°C	DIN 51 794	
Wick flame persistence time	≤ 5	sec	DIN/ISO 14935	
Pour point	≤ -18	°C	DIN/ISO 3016	D 97
Particle distribution *	≤ 15/12	Code	ISO 4406	
Chlorine content	≤ 50	mg/kg	DIN 51 577-3	
Oxidation stability	≤ 2.0	mg KOH/g	DIN 51 373	
Hydrolytic stability Change of neutralisation number	≤ 2.0	mg KOH/g	DIN 51 348	
Electrical resistivity	> 50	MΩm	IEC 247	

* The cleanliness level refers to the oil condition on delivery. The required system cleanliness is dependent upon the system design. Suitable measures (e.g. filtration, separation) have to be taken to achieve this cleanliness level.

NOTE: THE INFRARED (IR) SPECTRA OF FRF SHALL MATCH WITH THE IR SPECTRA GIVEN AT PAGE-7.

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INVENTORY No

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PRODUCT STANDARD

ST22007

STEAM TURBINE

Page 5 of 7

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SUPERSEDES INVENTORY No.

2.13 LIMIT VALUES:

The following limit values should not be exceeded during the required life time:

- a) Kinematic viscosity:
Maximum alteration $\pm 5\%$ referring to the condition on delivery
- b) Neutralisation number:
Maximum increase 0.20 mg KOH/g referring to the condition on delivery
- c) Air release:
Max. 12 minutes
- d) Foaming at 25 degrees centigrade:
Tendency: max 200 ml
Stability: max 450 s

3.0 INFORMATION REQUIRED TO BE FURNISHED ALONG WITH THE OFFER:

3.1 The bidder shall furnish the complete technical information of the offered product which may also include a) product description, b) chemical name and structure, c) Infrared spectra of the fluid, d) properties, e) disposal procedure, f) minimum working life, g) storage, handling and safety instructions, h) shipping method to be adopted at the time of delivery.

3.2 The bidder shall furnish confirmation regarding compliance of all the requirements as specified in this purchase specification along with the offer. In case of any deviation, the same shall be clearly informed by the bidder at the time of offer.

3.3 The bidder shall submit list of their customers utilising the fluid for application defined as per clause 1.0.

3.4 The offered grade of FRF should be of approved grade by M/S Siemens, Germany / ^{BHEL}Haridwar.

3.5 The approval of FRF does not make the supplier free from their responsibility for the quality of their product. The purchaser must be informed without fail in case of any alteration in their product or manufacturing process. In such cases a new approval by BHEL will become necessary.

4.0 DOCUMENTS TO BE FURNISHED AFTER PLACEMENT OF ORDER:

4.1 The supplier shall inform about the test results from internationally accredited lab giving the batch no., parameter, actual value obtained, test method of the batches proposed to be delivered and take approval from the purchaser before its despatch. As a minimum the following parameters have to be checked as per clause 2.12. Viscosity; air release; neutralisation number; water content; foaming tendency, water separability or demulsification.

4.2 Certificate of compliance to the specification, and also certificate of compliance to the properties as per clause 2.12 as well as chemical structure formula as per clause 2.2 shall be furnished.

4.3 The supplier shall furnish a copy of Infrared Spectra of the batches proposed to be delivered.

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5.0 TEST CERTIFICATES / DOCUMENTS TO BE SUBMITTED WITH SUPPLIES:

10 nos. of hard copies and 3 nos. of soft copies of the following documents shall be furnished by the supplier along with each supply. The customer's and project's name shall be indicated on each document as prescribed by the purchaser.

- a) The test certificates as per clause 4.1 and the compliance certificate to the effect that the product supplied is natural trixylenyl phosphate ester fluid and properties as per clause 2.12.
- b) The supplier shall furnish Material Safety Data Sheet (MSDS) covering all information relating to human safety and environmental impacts of the hazardous materials particularly during its transportation, storage, handling and disposal.
- c) Marking of containers: The FRF must be delivered in cleaned containers. The following information are to be clearly indicated on each container:
 - (i) Product name, manufacturer / supplier, filling date, batch number, Net weight, Gross weight, Expiry date.
 - (ii) Corresponding symbol and minimum worded cautionary notice for flammable/ corrosive / toxic / harmful / irritant and oxidising etc. as applicable.

6.0 SPECIAL AGREEMENTS:

Special agreements concerning variations from the requirements of this specification need authorisation by the purchaser. These must be settled through letter.

7.0 FILLING OF THE SYSTEM BY THE SUPPLIER:

- 7.1 Before filling the system a 2 litre sample shall be taken and sent to the laboratory for analysis. In the case of more than one batch, the supplier will blend a 2 litre sample from those batches. The proportions of the blend should reflect the final mixture that will result from filling the various batches into the hydraulic control system. Permission for filling will be given by the owner / purchaser after review of test results of the sample.
- 7.2 Filling of the system shall be made by the supplier at his own risk and expense.
- 7.3 The filling is to be made through a filter unit having a mesh of 5 micron. The tools used for filling the system must not affect the quality of FRF.

8.0 SAFETY MEASURES:

The safety precautions which are to be observed by the personnel dealing with FRF, shall be clearly demonstrated / informed to the Purchaser by the FRF supplier in the form of specific safety instructions.

9.0 CROSS REFERRED STANDARDS:

DIN 51 502; DIN 51 562-1; DIN 51 381; DIN 51 558-1; DIN 51 777-3; DIN 51 589-1; DIN 51 599; DIN 51 757; DIN ISO 2592; DIN 51 794; DIN ISO 14935; DIN ISO 3016; ISO 4406; DIN 51 577-3; DIN 51 373; DIN 51 348; IEC 247; ASTM D 445; ASTM D 3427; ASTM D 974; ASTM D 1744; ASTM D 892 (Seq.1); ASTM D 1401; ASTM D 1298; ASTM D 92; ASTM D 97.

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17/11/04

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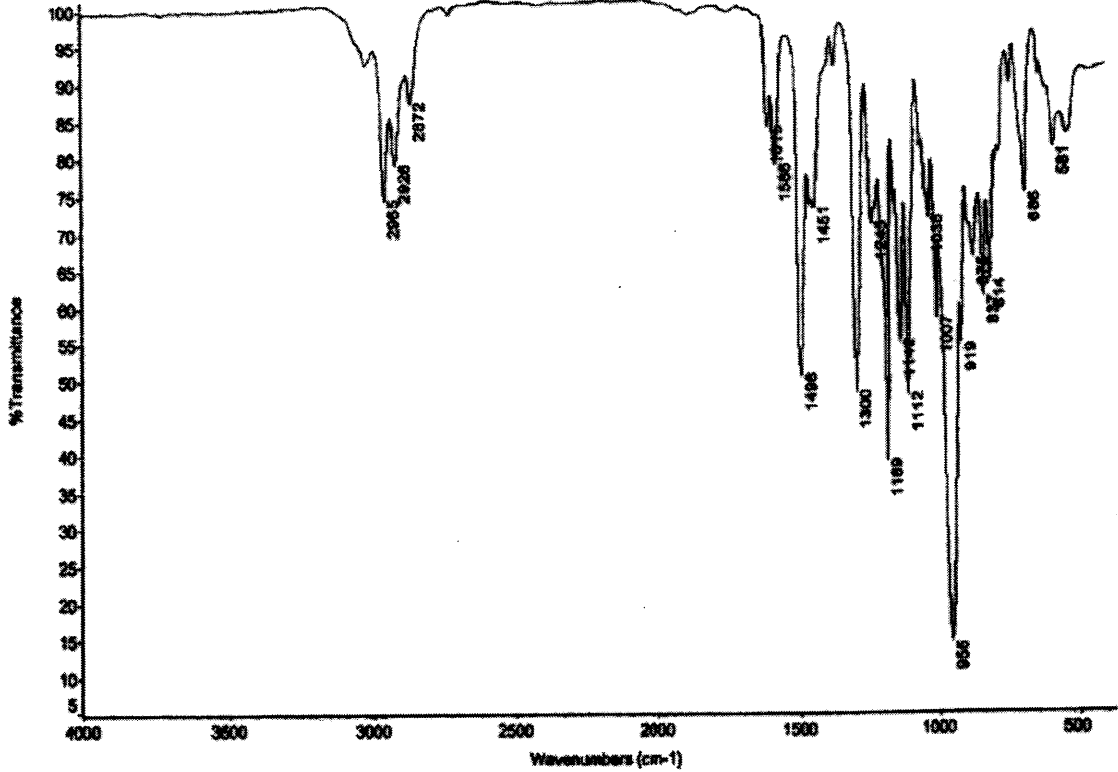
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Infrared spectra of FRF (Trixylenyl phosphate)

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INVENTORY No.

P-5373

REV.: 03

WORKED BY:

VIKAS

CHECKED BY:

RCA/VK

Vikas
14/11/12

RCA/VK
14/11/12 / *Kumar*