TECHNICAL SPECIFICATION OF DUPLEX OIL FILTER

1.0 INTENT OF SPECIFICATION :- The specification is intented to cover design, manufacturing, assembly, testing and supply of Duplex filter complete with commissioning spares(including one set of filter element and one set of all seal gaskets), special tools & tackles & differential pressure switch cum indicator(as per specification given in Anexure-1). The duplex filter is intented for operation in conjunction with Steam Turbines and should be suitable for operation at an ambient temperature of 60°C & 95% humidity.

2.0 FUNCTION :- One side of duplex filter comes in operation with the start of any one of the lubricating oil pumps and remains in service as long as any one of the lubricating oil pump runs. The other side of the duplex filter remains as a stand-by and is brought into operation when the running side gets saturated with dirt and other contaminants which is reflected by the differential pressure read across the inlet and outlet of filter.

The stand by filter is kept in primed condition to facilitate the immediate change over. The change over device must prevent both the filters being off at the same time. The change over should be possible by the operation of single hand wheel.

3.0 OIL SPECIFICATION :- The specification of oil to be filtered complies with IS : 1012 or ISO VG 46. The equivalent grades of various oil suppliers are servoprime 46 of M/s Indian Oil Corporation and Turbinol – 47 of M/s Hindustan Petroleum Corporation.

Kinematic viscosity at 50°C	: 28 CS
Specific gravity at 50°C	: 0.852
Flash point	: 200°C (Min.)
Operational temperature	: 40°C
Pour point	: -6.0°C (Max.)

3.1 COMPLIANCE WITH NATIONAL STANDARD —— NIL ——

4.0 FILTER DATA :-

Type	: Duplex
Inlet/Outlet Nozzles	: Flanged

Variant no.	01	02	03	04	05	06	07	08
Capacity (M^3/hr)	40	130	250	7	60	170	6	130
Nozzle size Nb(mm)	100	125	200	25	125	150	25	150
Design Pr. (Kg/cm^3)	12			250	12		250	12

Design Temperature	: 50° C
Actual pressure drop cleaned condition	: 4000 mm wc(Including change over valve
Actual pressure drop saturated condition	: 12000 mm wc for var. 01 to 06 and 08 42000 mm wc for var. 04 and 07
Quality of filtration	: 37 micron

				नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
MEMBER PSC	R.PANJA	8-7-07	अनुवादक TRANSLATED BY		
QAX	N K Manwani		निर्माणकर्ता WORKED BY	M.SINGH	
TSX	V.K.CHAUHAN		जांचकर्ता CHECKED BY	S.D.ROY	31/7/07
सहमत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	S.C.A.	9/8/7
			स्वीकृति : APPROVED : A.K. JAIN		11/8/7 8.20
REV.NO. 02 Dt.27.07.2007			निर्माण : PREPARED : STE	जारी : ISSUED : STE (TL)	दिनांक : DATE : 02.02.1993

दिनांक एवं हस्ताक्षर SIGN & DATE

SUPERSEDES INVENTORY NO. सामग्री सूची संख्या को अधिक्रमित करता है

हस्ताक्षर एवं दिनांक SIGN & DATE 13.8.07

सामग्री सूची संख्या INVENTORY NO. P-S136

5.0 DESIGN, MATERIAL & CONSTRUCTION OF FILTER :-

a) Filter element	: Wire cloth of 25 micron to 40 micron	
	: Material Stainless Steel	
	: Pleated type filter Elements are not acceptable	
	: Elements shall be cleanable type for reuse.	
b) Filter body	: Seamless pipe ASTM A 106 Gr. B or equivalent for var .01, 02, 03, 05,06, 08 and ASTM A 105 or equivalent for var. 04 & 07.	
c) Change over Valve	: Type	Ball valve
	: Body Material	ASTM 216 Gr. B or equivalent
	: Internals	Stainless Steel
d) Sealings	: VITON	

Materials of other components shall be selected by the bidder. The materials of construction of filter shall be such as to resist corrosion & erosion and shall give a long trouble free service. No cast iron components shall be acceptable. BHEL/owner reserves the right to ask for changes in materal.

At suitable points on filter, lifting lugs shall be provided for ease of transportation & erection. Their locations must be shown on the dimensional drawings.

Each side of the filter shall be provided with a vent connection suitable for pipe thread R1/4" and a drain connection suitable for pipe thread R1/2" for var. 01, 04 & 07 and R1" for var.02, 03, 05, 06 & 08. Vent connections should necessarily be provided on the sides of each filter chamber top flange to facilitate removal of filter cover for cleaning / maintenance without removal of vent piping connected to this connection.

Priming line with a valve shall be provided between two filter chambers. The filter as per var. 01, 02, 03, 05, 06, 08 is envisaged to be mounted in a tray and the distance between legs of filter shall be above inlet connection. Other dimensions shown in the sketch are binding.

The filter as per var. 04 & 07 shall be provided with suitable arrangement to support it with Main Oil Tank /steel structure.

6.0 QUALITY ASSURANCE, INSPECTION AND TESTINGS :

6.1 The bidder shall submit quality plan along with his offer format for BHEL/Owner's approval.

6.2 The particulars of the proposed shop tests and procedures for the tests shall be submitted to BHEL/Owner for approval along with Quality Plan.

6.3 The filter shall be dispatched only after inspection, approval of test certificates and clearance from BHEL/Owner.

6.4 Wherever welding is involved, it is to be carried out by qualified welders and weld procedures are to be qualified as per ASME code section-IX.

6.5 The minimum tests/checks to be carried out on the Duplex Oil Filter are given below. BHEL/Owner reserves the right to ask for any more checks at the time of Quality Plan finalisation.

6.5.1 Testing of materials: The material of body, spindle, disc seat, filter elements etc. shall be tested as per relevant standard for its chemical composition, mechanical properties viz. YS. UTS, impact, %age elongation, reduction in areas etc and NDT . The test certificates for all the tests indicating
02 actual test results should be furnished. Supplier shall give the type and details of NDT to be carried out along with the offer. Material certificate of conformance & acceptable in case of M/s hydac & M/s EPE & BOLL & KIRCH.

6.5.2 All butt welds shall be subjected to 10% RT and all fillet welds to 100% MPI. All welding Shall be carried out by qualified procedures and welders.

6.5.3 Following tests shall be carried out during various stages of manufacturing at bidder's works :-

a) Check for dimensions of all the component.
b) Hydraulic Test : The body of filters shall be tested at one and half times the design Pressure in fully assembled condition for 5 mts.
c) Seat leakage test : It shall be carried out at the design pressure for 5 minutes. Acceptance norms shall be nil leakage.
d) Functional Test : It shall demonstrate smooth operation of change over valve.
e) Verification of mesh size of element : By recognised lab.
f) Collapsibility Test : A type test at a differential pressure of 5.0 kg/cm² for var 01,02,03,05,06 & 160.0 kg/ cm ² for variant 04 & 07. This test shall be conducted as per ISO : 2941.
g) Pressure Drop Test : As per ISO 3968. The pressure drop in clean condition should not exceed 0.4kg/cm² including change over valve. This is type test.

7.0 DOCUMENTS:

A. Along with offer :
i) Detailed catalogue with electrical contact rating.
ii) Assembly drawing with part lists, material of each part, nozzle sizes & their coordinates, leg spacing, cross sectional arrangement incorporating overall dimensions.
iii) Pressure loss curve for normal flow at different flow areas.
iv) Details of priming connection, change over valve, differential pressure switch, flow direction indicator, etc.
v) Quality plan.
vi) Testing procedures.
vii) List of commissioning spares which will include one set of all type of seals/gaskets & one filter element.
viii) List of spares for 5 years of operation.
ix) List of special erection/maintenance tools.
x) Type test certificate for collapsibility test and pressure drop test shall be submitted alongwith the offer.

B. After Placement of order

i)	Documents listed at 7.0(A) above (for approval)	4 weeks
ii)	O & M instructions	12 weeks
iii)	Instruction on conservation and deconservation.	12 weeks

No. of copies shall be specified at the time of ordering. However if not specified, 10 copies shall be furnished by the bidder.

C. Along with Dispatch

i) Detailed catalogue
ii) Calibration & test certificates
iii) Guarantee certificate
iv) Type test certificate for degree of protection

8.0 IDENTIFICATION : The name plate of filter shall have following information

i) Type/Designation : Duplex filter

ii) Tag no.

Var.	01 & 05	02,03,06&08	04 & 07
Tag no.	MAV43 BT001	MAV42 BT001	MAV35 BT001

iii) Nominal size of inlet / outlet nozzles
iv) Press loss (in cleaned condition)
v) Manufacturer's name
vi) Medium
vii) Purchase order no.
viii) Month & year of manufacture

9.0 CLEANING, PAINTING, CONSERVATION & PACKING : The bidder shall give exact and precise details about the measures envisaged by him for surface protection. Painting of interior surface coming in contact with oil is prohibited. After testing of filter its internals shall be thoroughly cleaned, dried and conserved before packing . conservation shall be suitable for storing in saline atmosphere & for a period of 2 years before use. Filter shall be suitably packed for transportation. Instruction should be issued regarding reconservation, deconservation and storage of package

10.0 GENERAL : The bidder can make suitable offers even if there are minor deviations which do not effect the efficient functioning of the equipment. However the deviation must be clearly spelt the same along with the offer. The offer may not be considered if all the technical particulars and information called for in the specification are not submitted along with the offer.

11.0 GUARANTEE :

i) **The supplier shall guarantee trouble free and satisfactory operation of the equipment for a period of 18 months after delivery or 12 months after commissioning whichever is earlier.**

ii) **The bidder shall guarantee the quality of filtration & pressure loss in cleaned and saturated conditions.**

iii) **If during erection / commissioning at site and deficiency in parts is detected. BHEL site office shall prepare the assessment report and copy of the same shall be forwarded to the bidder. The bidder shall replace / rectify the concerned items free of charge. The bidder if he so desires may depute his representative to site at his own cost with in one week after receipt of the above report, shall be final & binding on bidder of Duplex filter.**

12.0 DESPATCH : The equipment along with all accessories shall be dispatched to a destination to be specified after the placement of order.

ANNEXURE-1

DIFFERENTIAL PRESSURE SWITCH CUM INDICATOR :

1.0 The differential pressure switch shall consist of a calibrated indicator for indicating the differential pressure across each filter basket. Switch with electrical contacts shall be actuated when the differential pressure reaches preset value.

2.0 The differential pressure switch shall be suitable for Ambient temperature : 0-60°C and Relative humidity : 95%

3.0 Housing :

Body material	: Die cast aluminum alloy or stainless steel
Degree of protection	: IP 65
External surface	: Finished with staving enamel

4.0 Sensing element type : Diaphragm/piston

5.0 Material of sensing element and other parts in contact with the service medium : Stainless steel AISI 304 or equivalent

6.0 Differential pressure range : 0-1.2 kg/cm² for var. 01,02,03,05,06 & 08
0-6 kg/cm² for var. 04 &07

7.0 Max. static pressure : one and half times design pressure

8.0 Set point adjustment : The switching point shall be adjusted to operate at 0.9 kg/cm² in pressure increasing direction for var. 01, 02, 03, 05, 06 & 08 .for var. 04 & 07 the switching shall be set at 4.2 kg/cm². However, the set point for variants shall be adjustable over the specified differential pressure range. There shall be proper facility with suitable lockable arrangement for set point adjustment.

8.1 Switching repeatability : ± 1% of differential pressure range

8.2 Accuracy : Equal or better than ± 2% at mid 50% of differential pressure range

9.0 Electrical contact :

Contact type	: Snap action micro switch / Reed contact
Contact material	: Silver plated
Contact rating	: 0.25A / 120 V AC, 3W/ DC
No. of Contact s	: 1 No. change over type i. e. 1 SPDT
Contact life	: approx. $(10)^6$ switching cycles.

10.0 Electrical connection : Cable entry shall be provided with cable gland complete with neoprene grommet. Terminals shall be suitable for cable termination of 0.5 mm² cable core cross section.

11.0 Identification Tag : In addition to the instrument name plate, one separate stainless steel tag punched with tag no. MAV 43 CP 011 for variants 01 & 05, MAV 42 CP 013 for var. 02, 03, 06 & 08 and MAV 35 CP 016 for var. 04 & 07 shall be fastened with the switch, if not possible to engrave on instrument name plate.

12.0 Hydraulic impulse connection details = R1/4

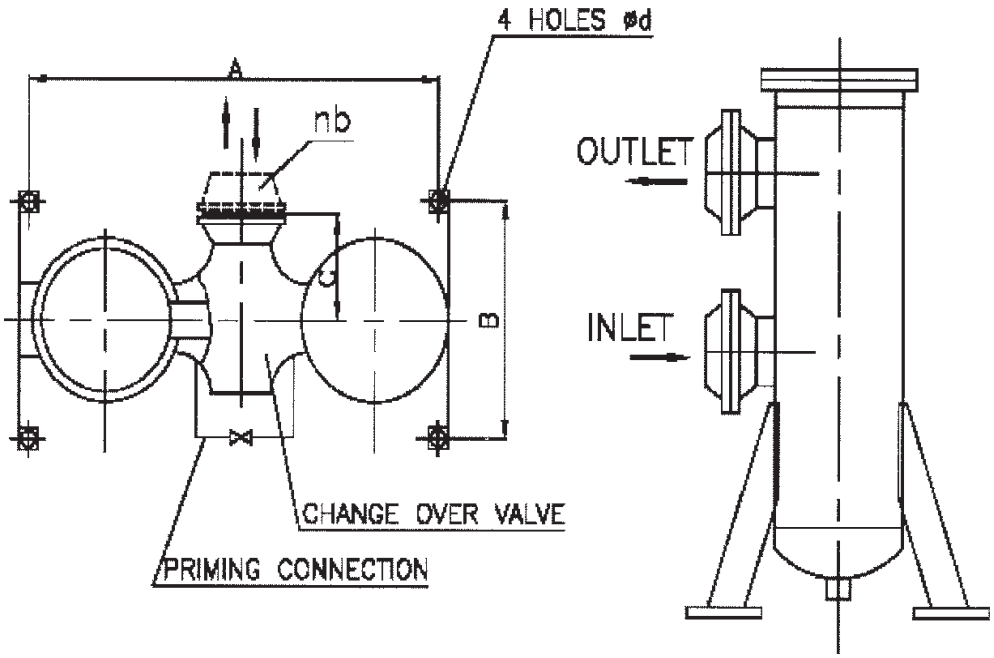
DATA SHEET TO BE FURNISHED BY THE BIDDER OF DUPLEXFILTER

1.0	a) Differential pressure switch cum indicator	Yes/ No
	b) Connected piping & valve	Yes/ No
2.0	Priming valve & piping	Yes/ No
3.0	Legs, flange connections & other dimensions as per sketch	Yes/ No
4.0	Contract drawings & curves	Yes/ No
5.0	Commissioning spares , O & M spares for five years of operation	Yes/ No
6.0	Special erection/ Maintenance tools	Yes/ No
7.0	Quality of filtration	Micron's
8.0	Pressure loss at normal flow :	
	a) In cleaned condition	mm wc
	i) In the filter	
	ii) In the valve	
	b) In saturated condition (50% chocked condition)	mm wc
9.0	Material of components as per clause-5	Yes/ No
10.0	Weight of filter	kg
11.0	Tests to be carried out :	
	a) Chemical composition & Mechanical properties of components mentioned in clauses – 5	Yes/ No
	b) NDT	Yes/ No
	c) Hydraulic test of body (filter & valve)	Yes/ No
	d) Functional test	Yes/ No
	e) Collapsibility test	Yes/ No
	f) Mesh size verification from recognized lab	Yes/ No
	g) Pressure drop test	Yes/ No
12.0	Gross filtering area	mm^2
13.0	Net filtering area	mm^2

LIST OF CROSS REFERRED STANDARD —— NEXT PAGE.

REV. NO. 02		निर्माणकर्ता WORKED BY	M.SINGH		
P-5136		जांचकर्ता CHECKED BY	SDR		31/7/07

Cross reffered standard:- IS:1012-1978
ISOV 46 ! ISO 2941, ISO 3968
AISI-321/316



! DIMENSIONS ARE INDICATIVE ONLY NOT BINDING

VAR. NO.	nb	A	B	C	d	FLANGE DETAILS
08	150	1120	560	255	23	DIN 2633
06	200	1180	560	285	23	
05	125	890	560	235	23	
03	200	1315	560	285	23	
02	125	890	560	235	23	
01	100	785	320	235	18	

DUPLEX FILTER