DAKSHIN HARYANA BIJLI VITRAN NIGAM LIMITED

SPECIFICATION NO. S-132/DD-177

TECHNICAL SPECIFICATION FOR ENERGY EFFICIENT PUMPSETS

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TECHNICAL SPECIFICATION FOR ENERGY EFFICIENT PUMPSETS

1. SCOPE:

This specification covers design, engineering, manufacture, assembly, stage testing, inspection & testing before supply and delivery at site of the energy efficient pumpsets.

1.1 The Equipment Offered shall be complete with all parts necessary for their effective and trouble free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.

1.1.1 It is not the intent to specify herein complete details of design and construction. The equipment offered shall conform to the relevant standards and be of high quality, sturdy, robust and of good design and workmanship complete in all respects and capable to perform continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements. In actual practice, notwithstanding any anomalies, discrepancies, omissions, incompleteness, etc. in these specifications, the design and constructional aspects, including materials and dimensions, will be subject to good engineering practice in conformity with the required quality of the product, and to such tolerances, allowances and requirements for clearances etc. as are necessary by virtue of various stipulation in that respect in the relevant Indian Standards, International standards and other statutory provisions.

1.2 The Tenderer / supplier shall bind himself to abide by these considerations to the entire satisfaction of the Purchaser and will be required to adjust such details at no extra cost to the purchaser over and above the tendered rates and prices.

1.3 Tolerances on all the dimensions shall be in accordance with provisions made in the relevant Indian/ International standards and in these specifications. Otherwise the same will be governed by good engineering practice in conformity with required quality of the product.

2. APPLICABLE STANDARDS:

The materials shall conform in all respects to the relevant Indian Standard Specifications with latest amendments thereof; some of them are listed below.

IS: 8034 submersible pump sets
IS: 9283 submersible pump set motors

Material conforming to other internationally accepted standards, which ensure equal or higher quality than the standards mentioned above would also be acceptable. In case the Bidders who wish to offer material conforming to the other standards, salient points of difference between the standards adopted and the specific standards shall be
clearly brought out in relevant schedule. Four copies of such standards with authentic English Translations shall be furnished along with the offer.

The minimum overall (pump and motor combined) efficiency should be without any minus tolerance.

The energy efficient pumpset should be minimum ‘THREE STAR’ rating of Bureau of Energy Efficiency.

3. **SERVICE CONDITIONS:**

The energy efficient pumpsets to be supplied against this specification shall be suitable for satisfactory continuous operation under the following climatic conditions:

- **i)** Peak ambient temperature: 50°C
- **ii)** Minimum Ambient Temperature in shade: -5°C
- **iii)** Maximum average ambient temp. in 24 hours period in shade: 40°C
- **iv)** Maximum yearly weighted average ambient temperature: 32°C
- **v)** Maximum temperature attainable by an object exposed to sun: 60°C
- **vi)** Maximum relative humidity: 100%
- **vii)** Average number of thunder storm days per annum: 40
- **viii)** Average number of rainy days per annum: 120
- **ix)** Average annual rainfall: 900 mm
- **x)** Number of months of tropical monsoon conditions: 4 Months
- **xi)** Maximum wind pressure: 195 kg/m²
- **xii)** Altitudes: Not exceeding 1000 mtrs.

The equipment shall be for use in moderately hot and humid tropical climate, conducive to rust and fungus growth.

4. **DESIGN & CONSTRUCTION:**

**Prime Mover – Motor**

The motor in principle is a squirrel cage induction motor & hence theoretically is governed by the general theory of the induction motor and water lubricated sealed against entry from outside water.

The winding shall be of wet type. The thrust bearings should be of wet type water lubricated and provided with metal tilting thrust pads, designed to take all untoward load at most unfavorable running conditions. The windings shall be accessible to facilitate checking and locating any fault without disturbing all the coils and also to enable replacement of any defective coils.

Full proof sealing arrangement by sand guard shall be provided in the Motor inlet body to prevent tubewell water impurities like sand, silt from entering the motor bearing.

Full proof arrangement should be made for stopping the rotating of shifting of stampings inside the stator body due to operation of pump sets. Earth leakage current should not be more than 50 milli ampere at rated voltage.

**Stator**

The stator is the outer body of the motor, which houses the windings on an iron core. The stator core is made up of a stack of round pre-punched laminations pressed into a frame which may be made of aluminum or cast iron. The laminations are basically round with a round hole inside through which the rotor is positioned. The inner surface of the stator is made up of a number of
deep slots or grooves right around the stator. It is into these slots that the windings are positioned. The arrangement of the windings or coils within the stator determines the number of poles that the motor will have.

The motors for submersible pump sets should be with 2 pole configuration.

**Rotor**

The Rotor comprises a cylinder made up of round laminations pressed onto the motor shaft, and a number of short-circuited windings. The rotor windings are made up of rotor bars passed through the rotor, from one end to the other, around the surface of the rotor. The bars protrude beyond the rotor and are connected together by a shorting ring at each end. The bars are usually made of aluminum or copper, but sometimes made of brass. The position relative to the surface of the rotor, shape, cross sectional area and material of the bars determine the rotor characteristics.

A bar with a large cross sectional area will exhibit a low resistance, while a bar of a small cross sectional area will exhibit a high resistance. Likewise a copper bar will have a low resistance compared to a brass bar of equal proportions.

*The use of ETP Copper and Electrical Steel low watt loss for decreasing the Load Losses & No Load Losses, which would ultimately ensure high efficiency throughout the life cycle. This improvement in efficiency could result in an annual savings of million of kilowatt-hours.*

**Pump**

The pump consists of the impeller coupled to the motor shaft, which rotates along its axis & forces the fluid due to centrifugal action.

Pump performance is routinely measured as a combination of two factors; flow rate and pressure (head). Every pump will have a performance curve showing how its output (flow rate) changes when it is required to pump water to different heights. There is a trade-off between flow rate and head, with flow rate decreasing as head increases. When choosing a pump, one should consider both the volume of fluid to be pumped and the vertical distance required to be pumped.

In addition to taking into account the negative effect head will have on the performance of a pump, attention should also be shown to friction loss. Whenever water flows through pipe work, fittings, valves, elbows and even straight connectors, it will encounter differing degrees of resistance and therefore friction. The performance curve of the pump will not take into account friction loss. A good pump selection would be one whose flow rate is sufficient for the farm / crop.

<table>
<thead>
<tr>
<th>Description</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core length, mm</td>
<td>205</td>
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<tr>
<td>Rotor used (copper)</td>
<td>Fabricated</td>
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<tr>
<td>Thrust bearing</td>
<td>Carbon</td>
</tr>
<tr>
<td>Diffuser material</td>
<td>Noryl</td>
</tr>
<tr>
<td>Impeller material</td>
<td>Noryl</td>
</tr>
<tr>
<td>Motor efficiency (%)</td>
<td>76.8</td>
</tr>
<tr>
<td>Full load speed (RPM)</td>
<td>2885</td>
</tr>
<tr>
<td>Full load current (Amps)</td>
<td>8.3</td>
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<tr>
<td>Starting torque (% of full load)</td>
<td>180.5</td>
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<tr>
<td>Overall efficiency (%)</td>
<td>48.4</td>
</tr>
<tr>
<td>Head in m</td>
<td>56.27</td>
</tr>
<tr>
<td>Discharge in l p s</td>
<td>3.02</td>
</tr>
</tbody>
</table>
5. **RATING AND TERMINAL PLATES**

The ratings of submersible pumpsets vary from 3 BHP to 40 BHP (3, 5, 7.5, 10, 12.5, 15, 20, 25, 30, 40). Besides other particulars, following details shall also be given on the name plate of the motor:

i) Name of Manufacturer  
ii) Motor make/ Model.  
iii) Sr. No. and Mfg’s No. and frame reference  
iv) Frequency (Hz)  
v) Numbers of phases  
vi) Rated output in KW/HP and current in Amperes.  
vii) Rated Voltage  
viii) Winding connection  
ix) Rated RPM  
ix) Year of Manufacture

All details on the “NAME AND RATING PLATE” shall be indelibly marked i.e. by engraving or punching.

6. **TYPE TEST CERTIFICATE**

The bidder shall furnish type test certificate(s) of offered design / similar design, wherever available with the bid.

7. **QUALITY ASSURANCE PLAN**

The purchaser intends to purchase Energy Efficient Pumpsets only from Quality conscious manufacturers. Preference shall be given to those who possess ISO 9001 / 9002 Certification.

The bidder shall furnish the details in respect of following, in the schedule prescribed herewith this specification, failing which the offer is liable for rejection.

a) List of testing equipment and instruments available with bidder for inspection, testing and checking the energy efficient pumpsets offered, as per tender specification in the schedule of testing facilities. The calibration details should also be included.  
b) List of machines, equipment/ T&P available with the bidder for manufacturing the energy efficient pumpsets, in the schedule of Plant and machinery  
c) Details of type tests conducted on the energy efficient pumpsets offered to supply in the schedule of type tests.  
d) List of raw material components and sub – assembly to be used for manufacturing the equipment offered, in the schedule of raw materials and components.

The bidder should possess adequate facilities for inspection and testing of the energy efficient pumpsets, as per requirement of the relevant ISS and this specification.
In case any supplier is found not having all the instrument/equipment required for testing, the offer shall be ignored. No borrowing of instruments/equipment shall be allowed. Testing of the energy efficient pumpsets shall also not be allowed at the works of any other manufacturer. However, testing may be allowed at any Government testing laboratory.

8. INSPECTION AND TESTING

All tests and inspection shall be made at the place of manufacturer unless otherwise especially agreed upon by the manufacturer and the purchaser. The manufacturer shall afford the inspector representing the purchaser all reasonable testing facilities, without charge to satisfy him that the material offered for inspection is in accordance with the requisite specifications.

The bidder shall give 15 days advance information to enable the purchaser to depute his representative for witnessing routine tests and acceptance thereof.

The manufacturer shall provide all services to establish and maintain quality of workmanship at his works and that of his sub-contractors to ensure the mechanical/electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 9001:2000.

CGM/P&D  CGM/MM  CGM/Commercial  GM/P&D
DHBVN, Hisar  DHBVN, Hisar  DHBVN, Hisar  DHBVN, Hisar
Guaranteed Technical Particulars

1. Material of Stator casing
2. Material of Rotor
3. Thrust Bearing Housing thrust Plate
   a) Segments
   b) Ball Retainers
   c) Steel Ball
4. Bearing Bush
5. Motor Shaft with rotating Sleeve
6. Pressure sustaining components
7. Impeller
8. Neck Ring/ Casing wear ring
9. Bowl
10. Shaft (pump)
11. Suction casing / Discharge casing / Last stage Bowl
12. Strainer
13. Sand Guard
14. Coupling Sleeve
15. Bearing Sleeve