

PETRONAS TECHNICAL STANDARDS

DESIGN AND ENGINEERING PRACTICE

CENTRIFUGAL SUBMERGED MOTOR PUMPS (IN REFRIGERATED PRODUCT OR PRESSURISED STORAGE SERVICE)

PTS 31.29.06.30

NOVEMBER 2010



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PTS No:	31.29.06.30
PTS Title:	Centrifugal Submerged Motor Pumps (in Refrigerated Product or Pressurized Storage Service)

This PTS 31.29.06.30- Centrifugal Submerged Motor Pumps (in Refrigerated Product or Pressurized Storage Service) has been updated and has incorporated PETRONAS Lessons Learnt, Best Practice and new information issued by relevant industry code and standards. This PTS is still valid and with editorial changes only.

The previous version of this PTS 31.29.06.30 (April 2003) will be removed from PTS binder / e-repository from herein onwards.

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PREFACE

PETRONAS Technical Standards (PTS) publications reflect the views, at the time of publication, of PETRONAS OPU/Divisions.

They are based on the experience acquired during the involvement with the design, construction, operation and maintenance of processing units and facilities. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good technical practice to be applied by PETRONAS' OPU in oil and gas production facilities, refineries, gas processing plants, chemical plants, marketing facilities or any other such facility, and thereby to achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where PTS may not cover every requirement or diversity of condition at each locality. The system of PTS is expected to be sufficiently flexible to allow individual operating units to adapt the information set forth in PTS to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use PTS they shall be solely responsible for the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, it is expected of them to follow those design and engineering practices which will achieve the same level of integrity as reflected in the PTS. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the owner.

The right to use PTS rests with three categories of users:

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1. INTRODUCTION

1.1 SCOPE

This PTS specifies requirements and gives recommendations for centrifugal submerged motor pumps (column-mounted or pot-mounted) in refrigerated product or pressurised storage service. This PTS shall be used in conjunction with data/requisition sheet PTS 31.29.02.93 for centrifugal pumps.

This PTS may be used for electro submersible hydraulic turbines.

This PTS is a revision of the previous publication of the same title and number, dated December 1996. A summary of the major changes from the previous edition is given in (1.5).

In the event of conflict between documents relating to the enquiry or order, the following hierarchy shall apply:

- 1st priority: the purchase order and variations thereto;
- 2nd priority: data/requisition sheet and variations thereto;
- 3rd priority: this PTS.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by PETRONAS, the distribution of this PTS is confined to companies forming part of or managed by PETRONAS Group. It may be distributed to Manufacturers nominated by them (i.e. the distribution code is "F", as defined in PTS 00.00.05.05).

This PTS is intended for use in oil refineries, chemical plants, gas plants and, where applicable, in exploration and production facilities and supply/ marketing installations. When PTSs are applied, a Management of Change (MOC) process should be implemented. This is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this PTS, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this document which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this document as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

- **Best efficiency point** is the flow at which a pump achieves its highest efficiency.
- **Continuous service** for this pump type is an uninterrupted operation period of at least 16,000 h under the conditions specified for the guarantee point, unless otherwise specified.
- **Column-mounted** is the installation of a complete pump assembly in a storage tank column.
- **Guarantee point** is the normal operating point as specified on the data/requisition sheet and the point at which the Manufacturer certifies that performance of the pump is within the tolerances specified (ref. API Std 610, section 4.3.1.1). At least the following data shall be shown on the data/requisition sheets for this point: flow, total differential head, rated suction pressure, density and viscosity of the pumped liquid, NPSHA and speed.
- **Intermittent service** is operation, including intentional stops and starts, under the conditions specified for the guarantee point.
- **Design pressure** is the greatest pressure at the specified pumping temperature for which the pump casing and the vessel (for pot-mounted pumps) are designed.

NOTE: This includes all intended operating conditions and possible upset conditions.

- **Maximum discharge pressure** is the maximum suction pressure plus the maximum differential head that the pump would be able to develop when operating at the specified conditions of speed, maximum density and lowest pumping temperature with the maximum impeller size installed.
- **Maximum rated discharge pressure** is the maximum suction pressure plus the maximum differential head that the pump would be able to develop when operating at the specified conditions of speed, maximum density and lowest pumping temperature with the furnished impeller size installed.
- **Maximum suction pressure** is the highest suction pressure to which the pump may be subjected during operation.
- **Minimum flow** is the higher of the two minimum flows defined below. Minimum flow does **not** refer to the minimum required process flow.
- **Minimum continuous thermal flow** is the lowest flow at which the pump can operate without its operation being impaired by the temperature rise of the pumped liquid.
- **Minimum continuous stable flow** is the lowest flow at which the pump can operate without exceeding the vibration limits imposed by this PTS.
- **Net positive suction head (NPSH)** is the total suction head determined at the suction flange (bell mouth) or at the centreline of the first impeller of the pump, minus the vapour pressure of the liquid at the highest temperature specified. Both suction head and vapour pressure are expressed in metres liquid absolute.
- **Net positive suction head available (NPSHA)** shall be determined by the Principal for the pumping system. NPSHA is the total suction head determined at a reference location (see below) minus the vapour pressure of the liquid at the highest temperature specified and at rated flow. Both suction head and vapour pressure are expressed in metres liquid absolute.

For *pot-mounted* pumps, the NPSHA is referenced to the suction flange of the pot.

For *column-mounted* pumps, the NPSHA is referenced to the centre line of the inducer or the impeller of the pump.

- **Net positive suction head required (NPSHR)** is the minimum NPSH required at rated flow and at highest specified liquid temperature to prevent a head drop of more than 3 % due to cavitation within the pump. This requirement is also applicable to multi-stage pumps when the NPSHR is established by a head drop measurement across the first impeller only; otherwise a head drop limitation of 1 % over the total differential head

shall be applied. The NPSHR is determined by the Manufacturer and shall be based on the pump handling the actual product specified on the data/requisition sheet. It shall be referenced to the suction flange (bell mouth) of the pump and expressed in metres of actual liquid.

- **Pressure casing** comprises all stationary pressure-containing parts of the complete pump unit, including all nozzles or other parts attached thereto subject to a differential pressure greater than 1 bar (ga).
- **Pot-mounted** is the installation of a complete pump assembly, process auxiliaries and power connections in a pressure vessel.
- **Pressurised storage service** is the handling of liquefied butane or lighter hydrocarbons stored in pressurised vessels at specified temperature.
- **Rated discharge pressure** is the discharge pressure developed by the pump at the guarantee point with the furnished impeller size and at rated flow, speed, suction pressure and density.
- **Rated flow** is the flow at the guarantee point.
- **Rated power** is the power required by the pump at the guarantee point.
- **Refrigerated product service** is the handling of butane or lighter hydrocarbons that are in the liquid phase under atmospheric pressure.
- **Rated suction pressure** is the specified suction pressure of the pump at the guarantee point.

1.4 CROSS-REFERENCES

Where cross-references to other parts of this PTS are made, the referenced section number is shown in brackets. Other documents referenced by this PTS are listed in (5.).

1.5 CHANGES FROM THE PREVIOUS EDITION

The previous edition of this PTS was dated April 2003 and is still valid with editorial changes only.