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NATIONAL IRANIAN OIL REFINING & DISTRIBUTION COMPANY
NATIONAL IRANIAN OIL ENGINEERING
& CONSTRUCTION COMPANY

NIOEC SP

NIOEC SPECIFICATION FOR MECHANICAL AGITATORS

FIRST EDITION

JANUARY, 2006

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IN THE NAME OF GOD**FOREWORD**

By their very nature, technical Specifications are continuously subject to modifications and revisions. To strengthen their merit and usefulness, continuous improvements, addendum, deletion of disparate information and consequently provision of updated revisions are to be made in order to ascertain that such Specifications meet the current requirements, inclusive of Iranian Petroleum Standards (IPS) and the recognized and acceptable national and international Standards, as well as the optimal codes and practices based on the accumulated in-house know-how and plant knowledge and experiences.

However, in reality, due to several reasons, not to mention the complexity of the matter, the ultimate goal of continuous direct embedment of the required changes on the relevant Specifications may be far reaching. Therefore, in the interim periods between the officially issued revisions, the required changes will appear in other documents related to the engineering and design work of the ongoing projects.

In response to the initiative of the Design and Engineering Directorate, and considering that the task of the execution of several important and mega projects for the realization of the new oil refineries, pipelines and oil terminals as well as improvements of the existing facilities, has been assigned to NIOEC, it was decided to update the NIOEC Specifications and to issue new official revisions.

The Design and Engineering Directorate was itself entrusted to carry out this important task, and as such by forming several special technical committees, working in close co-operation and cohesion and sharing their expertise and knowledge, the updated and revised NIOEC Specifications were successfully prepared and complied.

These Specifications are intended to be used for Oil Refineries, Distribution Depots, Oil Terminals, Pipelines and Pump Stations within NIOEC's projects, and have been proven to be of high value for such purposes. It must however be appreciated that these Specifications represent the minimum requirements and should in no way be interpreted as a restriction on the use of better procedures, engineering and design practices or materials.

We encourage and highly appreciate the users and other clear sighted and experts to send their comments on the Specifications to the Design and Engineering Director of NIOEC for evaluation and approval.

REVISION INDEX

REV. PAGE	1	2	3	4	5	REV. PAGE	1	2	3	4	5	REV. PAGE	1	2	3	4	5	REV. PAGE	1	2	3	4	5
1						26						51						76					
2	X	X				27						52						77					
3	X	X				28						53						78					
4	X	X				29						54						79					
5	X	X				30						55						80					
6	X	X				31						56						81					
7	X	X				32						57						82					
8	X	X				33						58						83					
9	X	X				34						59						84					
10	X	X				35						60						85					
11	X	X				36						61						86					
12	X	X				37						62						87					
13		X				38						63						88					
14		X				39						64						89					
15						40						65						90					
16						41						66						91					
17						42						67						92					
18						43						68						93					
19						44						69						94					
20						45						70						95					
21						46						71						96					
22						47						72						97					
23						48						73						98					
24						49						74						99					
25						50						75						100					

NOTES:

- 1) THIS SHEET IS A RECORD OF ALL REVISIONS TO THIS SPECIFICATION.
- 2) WHEN APPROVED EACH REVISION SHALL BE CONSIDERED AS A PART OF THE ORIGINAL DOCUMENT.
- 3) NUMBER OF PAGES EXCLUDES THIS SHEET AND THE COVER SHEET.

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CONTENTS:	PAGE NO.
INTRODUCTION.....	2
1. SCOPE.....	2
2. REFERENCES.....	2
3. UNITS.....	3
4. MODIFICATION TO IPS-M-PM-330(1).....	3

INTRODUCTION

To satisfy the requirement of this NIOEC Specification, Iranian Petroleum Standard IPS-M-PM-330(1)(2014) with the modifications as specified herein after shall be strictly followed.

The following annotations, as specified hereunder, have been used at the bottom right hand side of each clause or paragraph to indicate the type of change made to the equivalent clause or paragraph of IPS.

1. SCOPE

- 1.1. This Specification covers the minimum requirements for mechanical agitators including design, materials, inspection and testing which shall conform to the Iranian petroleum standards IPS-M-PM-330(1)(2014) With modifications.
- 1.2. Compliance with the provision of this Specification does not relieve the Contractor and / or Vendor of the responsibility of furnishing agitators and accessories of proper design mechanically suited to meet operating guarantees at the specified service conditions.
- 1.3. Unless specific exception accompanied by a description of the proposed substitute is recorded under the heading "Exception " in the manufacturers proposal it shall be mutually understood that the proposal is based on equipment which complies strictly with the requirement of these Specifications.
- 1.4. Resolution on cases not explicitly stipulated in this specification, or on cases where conflicts may arise among the requirements of the referenced / relevant IPS and international standards shall be made through written consent and approval of NIOEC.
- 1.5. Deviations from this specification will only be permitted in obtaining written approval from NIOEC.

2. REFERENCES

The following standards, codes and specifications, to the extent specified herein after, shall constitute a part of this NIOEC specification. Latest edition of the undated referenced documents and the cited edition of the dated references shall apply. The applicability of changes made to the dated references, after the cited date shall be mutually agreed upon between NIOEC and the vendor/contractor.

ASME (AMERICAN SOCIETY OF MECHANICAL ENGINEERS)

Boiler and pressure Vessel Code, Section VIII, Division 1, Pressure Vessels.

B16.5 "Steel Pipe Flanges and Flanged Fittings"

B1.20.1 "Unified Screw Threads"

IPS (IRANIAN PETROLUEM STANDARD)

IPS-M-PM-330(1) "Material and Equipment Standard for Mixers", 2014

NIOEC (NIOEC SPECIFICATIONS)

NIOEC-SP-00-10 "NIOEC Specification for Units"

NIOEC-SP-46-00	"NIOEC Specification for Pumps, Drivers and Auxiliary Equipment"
NIOEC-SP-47-09	"NIOEC Specification for Packaged Equipment"
NIOEC-SP-47-10	"NIOEC Specification for Noise Control and Vibration"
NIOEC-SP-60-02	"NIOEC Specification for Low Voltage Induction Motors"
NIOEC-SP-60-04	"NIOEC Specification For low Voltage Switch gear And Control gear"
NIOEC-SP-60-20	"NIOEC Specification for Medium and High Voltage Induction Motors"

3. UNITS

International system of units (SI) shall be used in accordance with NIOEC-SP-00-10, unless otherwise specified.

4. MODIFICATION TO IPS-M-PM-330(1)

This addendum revises the below listed articles of the referenced standard as follows:

5.1.1. (Modification)

Add the following sentences at the end of this clause:

Agitators, gears and auxiliary equipment covered by this Specification shall be suitable for the specified operating conditions and shall be designed and constructed for at least 3 years of continuous full load service.

5.1.3.2 (Substitution)

The Vendor shall submit noise emission data as per NIOEC-SP-47-10.

5.1.9 (Modification)

Add the following sentences at the end of this clause:

Mixers shall be motor driven and flange mounted. Motors, electrical elements and electrical installations shall meet the requirements of NIOEC-SP-60-02, NIOEC-SP-60-20, and NIOEC-SP-60-04.

5.1.14 (Addition)

Agitators are allowed to be equipped with reduction gear, but V belt drivers are not acceptable. Agitators used for preventing sludge deposition shall be equipped with automatically operated variable angle feature or manually operated swivel angle type as specified on mixer data sheet.

5.1.15 (Addition)

The agitator Vendor shall have responsibility for satisfactory hydraulic and mechanical performance of the equipment for the specified service.

5.1.16 (Addition)

The agitator Vendor shall review and comment on the Purchaser's vessel design, including baffles and sparge locations and agitator support method, and shall be responsible for building the agitator to fit into the vessel.

5.1.17 (Addition)

Agitator components shall be designed to fit through vessel manhole opening specified in the data sheets.

5.1.18 (Addition)

Material exposed to process fluids shall be specified on the data sheet. Other materials not in contact with process fluids, such as components of the drive assembly, shall be in accordance with manufacturer's standards.

5.1.19 (Addition)

The equipment to be supplied by the VENDOR shall include for each item, the mixer, coupling, coupling guard, driver assembly, seal, and any accessory required for proper and safe operation of the agitator unit for the specified conditions.

5.1.20 (Addition)

Unless otherwise specified, the mixer shall be furnished as a single unit, ready for installation and start-up on the vessel or tank connection nozzle without additional alignment of parts within the mixers unit. The correct mixer rotation should be clearly marked on the mixer housing. Lifting lugs, oil level gauge, weatherproof breather, coupling guard, magnetic oil drain plug and fill cap are to be included.

5.1.21 (Addition)

The piping, and or tubing shall be designed and arranged for easy disassembly to permit maintenance and cleaning, and shall be properly supported to prevent vibration and damage.

5.1.22 (Addition)

Minimum pipe wall thickness shall be in accordance with schedule 80 for nominal pipe size 1/2 inch through 1 1/2 inch and schedule 40 for nominal pipe sizes 2 inches and larger.

5.1.23 (Addition)

Purchaser shall provide sufficient "head clearance" to remove gear reducer, motor, shaft, etc., from the tank without building dismantlement. Vendor shall provide suitable information.



5.1.24 (Addition)

The equipment shall be provided with sufficient braces and lifting lugs to permit handling at the construction site with conventional sling or hooks without damage to the equipment.

5.1.25 (Addition)

The equipment shall be sufficient rigidity and strength to permit normal handling.

5.1.26 (Addition)

In cases where the agitator geometry, horsepower and input speed are specified by the Purchaser the Vendor shall be responsible only for mechanical performance of the agitator but shall comment on the Purchaser's specifications for the intended service.

5.2 Pressure casing and mounting flanges (Modification)**5.2.1 (Modification)**

Add the following sentences at the end of this clause:

Pressure containing parts which are within the scope of the ASME code, and mounting flanges shall be designed, fabricated, tested and inspected in accordance with latest edition of the ASME code and shall not be code stamped.

5.2.2 (Modification)

Add the following sentences at the end of this clause:

Mounting flanges shall be in accordance with ASME B16.5 unless otherwise specified and shall be designed as a pressure part of the vessel in accordance with section VIII of the ASME code.

5.2.3 (Modification)

Add the following sentences at the end of this clause:

Pressure containing parts shall have a minimum corrosion allowance of 3 mm, unless otherwise Specification in data sheets.

5.2.4 (Modification)

The following items shall be added:

- e) Bolts and nuts shall be secured by 316 stainless steel locking devices.
- f) Vendor shall furnish bolt torque values with his installation instructions.

5.3.3 (Modification)

Add the following sentences at the end of this clause:

Threaded connections for packing and seal flush, vents, and lubrication shall be 1/2 inch minimum size.

5.3.7 (Addition)

Threaded connections shall not exceed 1-1/2 inch and shall be in accordance with ASME B1.20.1.

Flange connections shall conform to ASME standards.

5.4.7 (Modification)

Add the following sentences at the end of this clause:

Discs and stabilizers may be spilt to permit removal through manhole openings of specified size.

5.4.8 (Addition)

Shafts shall be of adequate stiffness for hydraulic side-forces, overhang and torque and shall be designed for no shaft whip when the agitator is running in an empty vessel. First critical speed of the shaft shall be a minimum of 30 percent above the operating speed. Critical speed shall be stated by the Vendor.

5.4.9 (Addition)

Bolting design shall prevent loosening in service. Manufacturer shall provide recommended torque values for all bolting on agitator assembly drawings.

5.5.1.4 (Addition)

A shut-off device with corrosion resistant metal sealing faces shall be provided to allow removal and replacement of seals or packing without emptying the contents of the vessel.

5.5.1.5 (Addition)

The seal housing, including gland, shall be of the same material as wetted parts. Seal components such as seat retainers or supports, locking or clearance collars, set screws, plugs, etc., which would be exposed to corrosive liquids or vapors leaking by the seal faces or secondary seals shall be of corrosion resistant material compatible with agitator construction.

5.5.2.6 (Addition)

Mechanical seal assemblies shall be of cartridge design and shall be removable without removing the agitator drive unit.

Unless otherwise specified, mechanical seals in replaceable bench testable cartridge assemblies shall be provided on all agitators. Seal combinations shall be carbon rotating and silicon carbide stationary sealing components or as indicated on the data sheets. Springs and metal parts shall be 316SS or as indicated on the data sheet. Seal operating conditions shall be as stated on the agitator data sheets.

5.5.2.7 (Addition)

Provision shall be made for removal of mechanical seal assemblies without emptying the tank and removal of speed reduction units or motor drivers. Also, means shall be provided to support propeller shafts from outside the tank during seal removal or installation.

5.5.2.8 (Addition)

Provision shall be made to drain away seal leakage and prevent accumulation on the mounting flange.

5.5.2.9 (Addition)

Connections in the seal cartridges shall be 1/2" NPS minimum.

5.5.2.10 (Addition)

Seal flush piping, if required, shall be provided as specified on the data sheet.

5.6.3 (Modification)

Add the following sentences at the end of this clause:

Impeller and shaft assemblies shall be statically and dynamically balanced.

5.7.1.2 (Modification)

Add the following sentences at the end of this clause:

Anti-friction bearings shall be selected for a 48,000 hours L10 minimum bearing life.

5.8.1 (Modification)

Material of the main components of mixers shall be stated by the VENDOR on the datasheet.

5.9.2 (Modification)

Add the following sentences at the end of this clause:

f) Manufacturer name

5.9.3 (Addition)

Each mixer shall be provided with a direction of rotation arrow on suitable place of the casing with the same material of name plate.

6.1.13 (Addition)

Replacement of bearings, shaft sealing devices, gear unit, and driver shall be possible without dismantling other major parts of the unit, and without emptying or depressurizing the vessel.

6.1.14 (Addition)

Speed reducers shall be conservatively designed to transmit the required power and withstand all external overhung and thrust loads including overloads imposed in service over the entire range of operating temperature. A positive lubrication system shall be employed to ensure a continuous supply of oil to the gear mesh and to the bearings where indicated on data sheet. An oil level sight

shall be provided. The gear service factor shall be not less than 1.4 based on the rating power of the motor.

6.1.15 (Addition)

Component parts shall be provided with means to insure accuracy of realignment during reassembly.

6.2.1 (Addition)

Coupling of the driver shaft to the mixer shaft, if required, shall be outside the pressure vessel.

6.2.3 (Modification)

Add the following sentences at the end of this clause:

Couplings which must be removed for normal maintenance shall be provided with suitable fits and spacers to permit removal of seals and bearings without removing major item of equipment.

6.2.7 (Addition)

In-tank couplings are not permitted.

7.1.7 (Addition)

Approval or release of equipment for shipment shall not relieve Manufacturer of any responsibility or guarantee. Acceptance of shop tests shall not constitute a waiver of field performance requirements under specified operating conditions, nor shall shop inspection by Purchaser relieve Manufacturer of responsibilities in case of later discovery of defective material or workmanship.

7.2.1 b) (Modification)

Add the following sentences at the end of this clause:

Copies of Manufacturer's unpriced Purchase Orders to all sub-Vendor/Contractors (for all items specified on bills of materials).

7.2.1 (Modification)

Add these items:

- f)** Evidence, such as purchase Specifications or bills of materials to establish that major parts are of specified materials.

7.3.2 b)(Modification)

Add the following sentences at the end of this clause:

Measurement of shaft run out at seal face shall be taken with seal pressurized and mixers running at operating speed.

If specified, mechanical seal cartridges shall be bench tested at design differential pressure and design speed.

7.3.2(Modification)

Add this item:

- d)** Gears drivers and power transmission equipment shall be given the Vendor's standard mechanical shop running test.

7.4.1 (Substitution)

Equipment shall be suitably protected for shipment and outdoor storage for at least Two (2) Years, see NIOEC-SP-47-09.

7.4.4 (Substitution)

All carbon steel and cast iron external surfaces of equipment which are not machined shall be cleaned, primed and finish painted in accordance with the manufacturer's standard paint.

7.4.5 (Substitution)

All exterior machined surfaces and internal surfaces shall be protected with a suitable corrosion inhibitor of a type that:

- 1- Provides protection during outdoor storage for a period of two years exposed to a normal refinery environment.
- 2- Does not have to be removed prior to operation.

7.4.9 (Modification)

Add the following sentences at the end of this clause:

Small or fragile parts or attachments shall be removed, tagged, wrapped in waterproof material and packed in a box fastened to the unit skid or base plate.

7.4.11 (Substitution)

One complete set of the installation, operation and maintenance instructions in addition to the number called for in the purchase order shall be packed in the boxes or crates with the equipment.

8.1 d) (Substitution)

Preliminary outline drawings showing dimensions and weights of equipment.

8.1 e) (Modification)

Add this to end of 8.1e: such as shaft , seals, bearings, gear box construction and seal shut-off device.