

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00



Technical Requisition For:

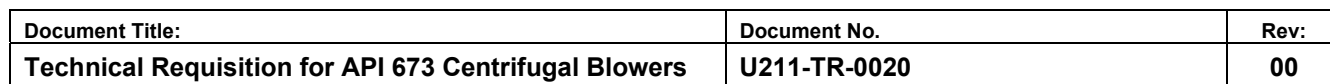
CENTRIFUGAL BLOWERS (API673)

Client: NIS AD, Novi Sad, Serbia

Project Number: U211

Project Name: Replacement Of Critical Rotary Equipment in Refining Block

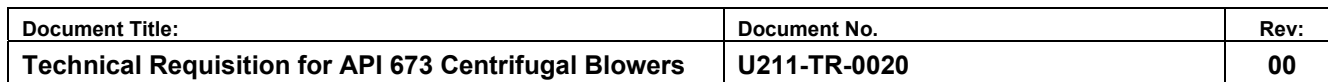
Location: Pancevo Oil Refinery

[illegible]

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

List of Attachments

DOCUMENT NUMBER	DESCRIPTION TITLE	REVISION
1. TECHNICAL REQUISITION		
1.1. U211-IC-SP-0007	Instrumentation Requirements for Centrifugal Blowers	00
2. DATASHEETS		
2.1. U211-MR-034	Datasheet – Centrifugal Blower	01
2.2. U211-MR-057	Datasheet – Centrifugal Blower	00
SUPPLIER DOCUMENT REQUIREMENTS (SDR)		
2.3. U211-SDR-0015	SDR – Mechanical	00
2.4. U211-SDR-0016	SDR – Electrical	00
2.5. U211-SDR-0017	SDR – Instrumentation	00
3. SPECIFICATIONS		
3.1. U211-EL-SP-0012	ES for Package Units	00
3.2. U211-EL-SP-0013	ES for Medium Voltage Cage Induction Motor	00
3.3. U211-EL-SP-0014	ES for Low Voltage Cage Induction Motor	00
3.4. U211-IC-SP-0008	Instrumentation-General	00
3.5. U211-IC-SP-0009	Instrument Design	00
3.6. U211-PR-DS-0006	Site and Utility Data Sheet	00
4. MISCELLANEOUS		
4.1. U211-TR-0021	Tech. Excl. & Deviations Summary (TEDS)	00
4.2. U211-TR-0022	TEDS (Instructions for Completion)	00



WBD Contract No: U211

Issued for Comments	00	19-Aug-2024	MG	MR	GS
Revision descriptions	Rev	Date	Originator	Checker	Approver

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

CENTIFUGAL BLOWERS (API 673)

INDEX

SECTION	PAGE
1. <u>GENERAL</u>	6
2. <u>SCOPE OF SUPPLY</u>	7
2.1 BY VENDOR	7
2.2 BY OTHERS	7
3. <u>VENDOR'S OBLIGATIONS / RESPONSIBILITIES</u>	8
4. <u>CODES, SPECIFICATIONS AND STANDARDS</u>	9
5. <u>AUTHORITY APPROVALS</u>	10
6. <u>ENGINEERING REQUIREMENTS</u>	11
6.1 <u>GENERAL</u>	11
7. <u>REFERENCES</u>	12
8. <u>CENTRIFUGAL BLOWERS REQUIREMENTS</u>	16
9. <u>ACCESSORIES</u>	19
10. <u>OPERABILITY AND MAINTAINABILITY</u>	25
12. <u>INSPECTION AND TESTING</u>	25
13. <u>PRESERVATION, STORAGE, PACKING AND TRANSPORT</u>	26

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

1. GENERAL

1.1 This "**Technical Requisition**" is issued to cover minimum requirements for purchase, design, manufacturing, inspection, testing, shipment, and documentation of CENTRIFUGAL BLOWERS units including drivers and auxiliaries.

1.2 The equipment shall be in strict accordance with this "Technical Requisition" and all other documents, codes and standards referred to in the "Technical Requisition" and its attachments (as listed in the "Technical Requisition" index). Any **exception to the "Technical Requisition"** documents and referred codes and standards shall be clearly advised to Client (in writing as part of the bid).

1.3 **Order of precedence** to be used in realization of this job is as follows:

- 1st. Rules and regulations of Serbia,
- 2nd. Technical Requisition for Centrifugal Blowers (this document) and all documents named in "List of Attachments" within this document.
- 3rd. Serbian or International technical standards.
- 4th. Vendor's specifications, documents and information.

Any conflict generated within this document and documents named in List of Attachments shall be referred to Client in writing for clarification and resolution.

1.4 Compliance with the "Technical Requisition" does not relieve Vendor from responsibility to deliver **equipment** of proper design, suitable for specified conditions. Any conflict between the Technical Requisition requirements and Vendor's opinion shall be clearly advised to Client (in writing).

Additionally, Vendor is responsible for:

- All co-ordination with sub-suppliers and collection of all details, drawings, data and all calculations to achieve optimum design and for submission of all documents requested.
- Engineering, performance and guarantee of the complete scope of supply of purchased materials.

In principal, all contacts with sub-suppliers shall be via Vendor.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

1.5 Following **terms** are used in this text:

Vendor: company selected for equipment delivery
 Subsupplier: company which provide particular equipment (e.g. blower, E-motor...) to Vendor
 WBD: project Contractor (Client's agent for design services)
 Client/Purchaser: company assigning the project and operating the plant (NIS Petroleum Industry of Serbia)

2. SCOPE OF SUPPLY

2.1 BY VENDOR

- Design, manufacturing and supply of equipment and material including relevant documents, inspections, testing etc. shall be, as a minimum, in accordance with this Technical Requisition and Centrifugal Blowers Data sheets included in the Technical Requisition.
- **Site Services:**
 Vendor's representative site supervision during equipment installation; SAT/COMMISSIONING and assistance during Start-up (assistance during the process of putting Centrifugal Blowers into operation)
 - During shutdown approximately 4 consecutive weeks (6 days per week; 12 hours per day), is required (if longer duration needed for supervision services, payments will be per daily rate).
 - During regular plant operation approximately 4 consecutive weeks (5 days per week; 8 hours per day)
- **Consumables:**
 Vendor will provide all lubricants for pre-commissioning, commissioning and start-up including one year of operation after successful start-up
- **Spare parts:**
 Spare parts for pre-commissioning, commissioning and start-up shall be included in the supply.
- **Special tools:**
 Special tools required for installation/maintenance (if applicable), shall be included in the supply.

2.2 BY OTHERS

Exclusions from Vendor's scope are:

- Concrete foundation and grouting material.
- Off-skid Process piping (including on/off valves, instruments...).

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

- Wiring (cables) to electrical consumers and to instruments, out of blower's skid
- Cable glands.
- Local control station for E-motor (start/stop buttons).
- Equipment installation to the foundation and grouting (however it has to be done under Vendor supervision).
- First fill fluids (to be defined by Vendor, but supplied by others)

3. VENDOR'S OBLIGATIONS / RESPONSIBILITIES

- 3.1. Vendor shall assume full and overall responsibility for the complete scope of supply.
- 3.2. Vendor shall be solely responsible for providing complete and operable API 673 Centrifugal Blowers in full accordance with applicable industry codes and standards, Serbian regulations, and Purchaser's technical requirements.
- 3.3. Vendor's proposal shall be based on equipment that complies strictly with the requirements of tender documentation, and in conjunction with the technical requirements and listed attached documents. Any proposed exceptions shall be recorded within the TEDS" document and accompanied by a description of the proposed substitution.
- 3.4. Proven, reliable, energy-efficient equipment is required.
 - Vendor may offer alternative designs that improve energy efficiency without reducing equipment reliability.
 - Proposed design features having less than two years' operating experience shall be specifically listed and details of construction shall be provided for Purchaser's review and written acceptance.
- 3.5. Vendor is fully responsible for the complete design, performance, implementation of quality assurance procedures and inspection of materials and components, manufacturing, testing and certification of the complete unit in full compliance with the requirements of this Technical Requisition and applicable Codes, Standards and Regulations.
- 3.6. Vendor shall obtain and co-ordinate all sub-supplier equipment activities as required to provide fully functional unit in accordance with the documents and requirements referenced herein (all requirements as listed in this Technical Requisition and its referenced documents shall be also imposed on his sub-suppliers).
- 3.7. In principle all contacts and correspondence between Purchaser and sub-suppliers will take place via the Vendor, if any.
- 3.8. Vendor shall ensure compliance with Serbian code and authority regulations. This includes delivery of all documents required to satisfy the code, the regulations and authorities. Status of authority approval shall be forwarded to Purchaser on a monthly basis.
- 3.9. Bidder shall indicate any deviation from tender documentation requirements and Technical Requisition as integral part within it's bidd. Requirements specified in the Technical Requisition shall be considered as minimum.

Replacement Of Rotary Equipment And Installations In Pancevo Oil Refinery

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

- 3.10. It is Vendor's responsibility to design, manufacture and deliver equipment in line with requirements of this Technical Requisition. Applicable exceptions, if any, to be listed in TEDS form attached.
- 3.11. For any technical concession request after order, Vendor is obliged to sent to Client vendor concession request for approval. Technical concession request must include all cost and schedule impacts, material availability or delivery issues, if any. Insufficient information may result in rejection. The Vendor Concession Request requires Purchaser's verdict and signature prior to start of the related activities. Any cost consequences related to approved concession request will be at Vendor's cost.
- 3.12. Any increased cost due to changes in the design or fabrication to meet the requirements of this Technical Requisition which are not caused by Purchaser and define through approved technical concession request by Purchaser are at Vendor's cost. If changes are caused by Purchaser cost will be at Purchaser. It will be regulated through change request.
- 3.13. Vendor shall perform all NDE examinations and testing using properly qualified personnel or subcontractors In order to fulfill requirements from Serbian legislation.
- 3.14. Vendor is responsible for all coordination with sub-suppliers and collection of all details, drawings, data and all calculations to achieve optimum design and on time submission of all documents requested in the Technical Requisition.
- 3.15. Purchaser's review of Vendor's documents does not relieve the Vendor of his responsibilities to deliver equipment, documents and services conforming to this Technical Requisition.
- 3.16. Any inspection performed by Purchaser in no way relieves Vendor of his responsibility for equipment to meet the requirements of the Technical Requisition and Serbian legislation.
- 3.17. Vendor is obliged to submit all documents defined in SDR (for all disciplines) within MDB package for Client approval. Documents must be approved by Client prior shipment of equipment.
- 3.18. Final documentation (MDB) shall be submitted by Vendor in 1 (one) hard copy and 1 (one) electronic copy in English language (with exception of IOM manual with should be included in MDB in both: Serbian and English version, as defined in SDR). Electronic copy have to be "searchable" in the most extent (excluding scanned material certificates and similar documents). Binding and printing requirements will be provided by Client.

4. CODES, SPECIFICATIONS AND STANDARDS

- 4.1 Unless otherwise specified, the latest edition of the specifications, codes and standards as specified in this Technical Requisition and/or its attachments shall be adhered to for the design and material requirements. As such, these documents form part of the Technical Requisition. It shall be Vendor's responsibility to acquire all required codes and standards.
- 4.2 The following listing shall not be considered as complete in case a reference is made in the below mentioned codes, specifications and standards to other relevant codes, specifications and standards these shall also be considered as applicable:

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

- Project specifications as per documents listed in Attachments.
- Serbian, international codes and standards referred to in Technical Requisition; latest edition unless specified otherwise.

4.3 Order of Precedence

The order of precedence shall be the latest revision of the following:

1. Serbian regulations, standards and codes.
2. Technical Requisition including all documents listed in Attachments
3. International codes and standards

Any conflict generated within the Technical Requisition not solved by the order of precedence shall be referred to Purchaser in writing for clarification and resolution.

5. AUTHORITY APPROVALS

- 5.1 Serbian **authority approvals** (certificates) shall be arranged and delivered by Vendor. This includes submittal of all required documents, assessment of design, arrangement of inspection and tests and obtaining certificates of conformance.

Serbian authority regulations that have to be adhered:

a) For pressure equipment:

- "PRAVILNIK O OPREMI POD PRITISKOM" (Sl. glasnik RS, br. 114/2021) - Serbian Rulebook for pressure equipment

b) For non-pressure equipment Vendor is obliged to address to the Ministry of Economy in Republic of Serbia for approval of foreign conformity documents

c) For electrical equipment placed in hazardous area:

- "PRAVILNIK O OPREMI I ZAŠTITNIM SISTEMIMA NAMENJENIM ZA UPOTREBU U POTENCIALNO EKSPLOZIVNIM ATMOSFERAMA" (Sl. glasnik RS, br. 10/2017 i 21/2020) - Serbian rulebook on equipment and protective systems intended for use in potentially explosive atmospheres

d) For machinery:

- "PRAVILNIK O BEZBEDNOSTI MAŠINA" (Sl. Glasnik RS. br. 58/2016 i 21/2020) - Serbian rulebook on machinery safety

In accordance Serbian legislation and standards shall nameplate also bear Serbian mark of conformity "3A".

5.2 CE MARKING

Equipment, materials and components which are CE certified, shall bear CE marking (if applicable) and shall be compliant to applicable EC or EU Directives, such as, but not limited to:

Vendor shall supply all authority documents required by EU legislative:

Replacement Of Rotary Equipment And Installations In Pancevo Oil Refinery

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

- Declaration of Conformity is required for complete equipment and also for particular equipment parts (components). Mandatory codes and specifications shall be specified in the declaration.
- Certificates of Conformity issued by Notified Body according to EU directives (if applicable).

Each piece of equipment (including instruments) shall be clearly identified by a nameplate, permanently attached to the equipment.

Vendor shall supply all authority documents required by EU legislative:

EC Declaration of Conformity in accordance with all relevant EU directives (especially e.g. for electrical equipment: LVD 2006/95/EC (73/23/EEC), EMC 2004/108/EC (89/336/EEC), ATEX 94/9/EEC etc.).

EC Declaration of Conformity is required also for particular equipment parts (components).

All equipment, material and components included in the delivery shall be CE certified and shall have CE marking (if applicable).

EC Certificate of Conformity issued by Notified Body, according to EU directives (e.g. ATEX 94/9/EEC, etc.).

All CE certified equipment shall be recertified in Serbia for approval of foreign conformity documents.

- 5.3 Vendor shall include all authority documentation, approval documentation, certification, etc, in the manufacturing data books.

6. ENGINEERING REQUIREMENTS

6.1 GENERAL

- 6.1.1 Requirements for Centrifugal Blowers are based on API Standard 673, "Centrifugal Fans for Petroleum, Chemical, and Gas Industry Services" latest edition.
- 6.1.2 Requirements of this specification are supplementary to API 673, forming a single set of specification requirements for Centrifugal Blowers.
- 6.1.3 Requirements in the API standard which are not ammended by or mentioned in this specification remain applicable.
- 6.1.4 "Technical Requisition" including all documents listed in Attachment shall be applied for this project.
- 6.1.5 SI units shall be used (except of "bar" required for pressure).
- 6.1.6 Equipment shall be designed for three (3) years of uninterrupted service (scheduled plant overhaul interval is 3 years) under conditions specified herein.
- 6.1.7 Unless otherwise stated in Data Sheets, Outdoor, unsheltered installation is considered. Vendor shall design proper winterization measures (e.g. scope of electrical tracing and

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

insulation – supplementary material will supplied and installed by Client). See “Site & Utility Data-Sheet” (U211-PR-DS-0006) for climatic conditions and design conditions.

- 6.1.8 Equipment shall be delivered pre-assembled to the maximum possible level. All components after assembly must be within the boundaries of the skid.
- 6.1.9 Vendor may offer alternative design if thus obtaining improvement over the specified equipment at the same or better cost with better operation or maintenance conditions and without decrease in quality. Alternatives require Client's approval.
- 6.1.10 Vendor shall review equipment design with regard to discover and eliminate any safety hazards and to assure comfortable operability and maintainability (good equipment ergonomics).
- 6.1.11 Vendor shall within offer submitt information regarding location of maintenance facilities applicable for the Client Site (closest to the Site). During equipment guarantee period Vendor's maintenance representative shall respond on Client's request till 48 hours after the request (equipment failure announcement) and solve the failure till 10 calendar days after the request (equipment failure announcement)
- 6.1.12 **Experience**
All equipment and its elements shall be of a proven design / size and shall be within Vendor's actual experience.
- 6.1.13 **Laws and Regulations / Authority Requirements**
Serbian laws, standards and regulations must be followed. Serbian standards are harmonized with EU standards. If EU certification is done Serbian recertification is required. Vendor is responsible to obtaine all required certificates and approvals.
- 6.1.14 Vendor can use his standard equipment-material Subsupplier (his standard Vendor List), if not specified otherwise within this Technical Requisition.

7. REFERENCES

Directive 2014/34/EU	Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres (ATEX) – mandatory from 20-Apr-2016
Directive 2014/68/EC	Pressure Equipment Directive
Directive 2006/95/EC	Low Voltage Electrical Equipment Directive
Directive 2014/30/EC	Electromagnetic compatibility (EMC)
Directive 2006/42/EC	Machinery Directive
API 673	Centrifugal Fans for Petroleum, Chemical, and Gas Industry Services

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

IEC 60079	Electrical Apparatus for Explosive Gas Atmospheres
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code)
IEC 60034	Rotating electrical machines
	Rotating electrical machines - Part 2: Methods for determining losses and efficiency of rotating electrical machines
IEC 60034-2	IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
	Adjustable speed electrical power drive systems
IEEE Std 519	Amendment 1 - Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy
IEC61800 1-5	Adjustable speed electrical power drive systems
IEC61800-5 1	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy
1:2007/AMD1:2016	
IEC 60146	Semiconductor converters - General requirements and line commutated converters
IEC 61508	Functional safety of electrical/electronic/programmable electronic safety-related systems
IEC 61511	Functional safety – Safety instrumented systems for the process industry sector
EN 62337	Commissioning of Electrical, Instrumentation and Control Systems in the Process Industry – Specific Phases and Milestones
EN 62381	Automation Systems in the Process Industry – Factory Acceptance Test (FAT), Site Acceptance Test (SAT) and Site Integration Test (SIT)
EN 62382	Control Systems in the Process Industry – Electrical and Instrumentation Loop Check
EN 13445	Unfired pressure vessels

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

EN 13480	Metallic industrial piping
IEC 60502	Power cables with extruded insulation and their accessories for rated voltages from 1 kV
IEC 60445	Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors
IEC 61439	Low-voltage Switchgear and Control Gear Assemblies
IEC 60085	Electrical insulation – Thermal evaluation and designation
IEC 60027-1	Letter symbols to be used in electrotechnology
IEC 60204-1	Electrical equipment of industrial machines
IEC 60617-DB	Graphical symbols for diagrams
IEC 61082	Preparation of documents used in electrotechnology
IEC 61346	Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations
IEC 60073	Basic and Safety Principles for Man-Machine Interface, Marking and Identification - Coding Principles for Indicators and Actuators
IEC 60079-14	Explosive atmospheres Gas & Dust - Part 14: Electrical installations design, selection and erection
IEC 60204	Safety of machinery – Electrical equipment of machines
IEC 60227	Polyvinyl Chloride Insulated Cables of Rated Voltages up to and Including 450/750 V
IEC 60287	Electrical Cables – Calculation of the Current Rating
IEC 60332	Tests on electric and optical fibre cables under fire conditions
IEC 60364	Electrical Installations of Buildings
IEC 60668	Dimensions of Panel Areas and Cutouts for Panel and Rack-mounted Industrial Process Measurement and Control Instruments
IEC 62305	Protection of Structures against Lightning

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

IEC 60072	Dimensions and Output Series for Rotating Electrical Machines
IEC 60331	Tests for Electric Cables under Fire Conditions – Circuit Integrity
ISA S5.1	Instrumentation Symbols and Identification
ISA S5.2	Binary Logic Diagrams for Process Operations
ISA S5.3	Graphic Symbols for Distributed/Shared Display Instrumentation, Logic and Computer Systems
ISA S5.5	Graphic Symbols for Process Displays
EN 10204:2004	Metallic products - Types of inspection documents
EN 13463 –1: 2009	Non-electrical equipment for potentially explosive atmosphere
EN 13463 – 5:2011	Non-electrical equip. for potent. ex atm. Protection by constr. Safety
IEC 61000	Electromagn. Compatib. for Industrial Process Meas. and Control
IEC 61131	Programmable Controllers
IEC 61784	Industrial Communication Networks - Profiles
IEC 62443	Industrial Automation and Control System Security
ISO 20816-1	Mechanical vibration — Measurement and evaluation of machine vibration
ISO 7919-3	Mechanical vibration — Evaluation of machine vibration by measurements on rotating shafts — Part 3: Coupled industrial machines
ISO 281	Rolling Bearings - Dynamic Load Ratings and Rating Life
API 670	Machinery Protection Systems
API 671	Special-Purpose Couplings for Petroleum, Chemical, and Gas industry services
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.10	Face to Face and End-to-End Dimensions of Valves
ASME B16.34	Valves – Flanged, Threaded and Welding End

Replacement Of Rotary Equipment And Installations In Pancevo Oil Refinery

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

ASME B31.3	Process Piping
ASME B46.1	Surface Texture (Surface Roughness, Waviness and Lay)
ASME B1.20.1	Pipe Threads, General Purpose (Inch)
API 614	Lubrication, Shaft Sealing, and Control-oil Systems and auxiliaries for Petroleum, Chemical and Gas Industry Services
API 541	Form wound squirrel cage induction motors – 345 kW (500HP) and larger
API 547	General purpose Form-wound Squirrel cage induction motors-185 kW through 2240 kW
API 686	Recommended Practice for Machinery Installation and Installation Design

8. CENTRIFUGAL BLOWERS REQUIREMENTS

8.1 **Basic design requirements**

Centrifugal blower ratings shall not exceed the limits of the Vendor's design and shall be within the Vendor's actual experience. Only equipment that has proven its reliability in similar operating conditions like requested in this Technical Requisition is acceptable. A reference of at least 3 units of the same type and size and with an accumulated experience of 25,000 hours of operation is required. Equipment that does not have an accumulated experience of 25000 hours is considered prototype and it will not be accepted.

The Client has specified within technical requisition equipment's normal operating point and all other applicable operating. The Vendor shall take in account of any other specified operating conditions with different compositions and molecular weights and consequent effect on his vibration control analysis. The Vendor shall design the blowers taking in to account ducting configuration and loads, alignment at operating conditions, supporting structure, handling during shipment and handling and assembly at the site, while actively requesting to receive information from the Purchaser and supporting their design with handling instructions and procedures.

Centrifugal blowers should normally be specified for constant-speed operation in order to avoid excitation of torsional, acoustic, and/or mechanical resonances.

All electrical components and installations shall be suitable for the area classification, gas grouping and temperature classes specified by the Client in the data/requisition sheets.

The combined performance of the blower and its driver under all operating conditions shall be responsibility of the Vendor. The combined unit (or complete package, if applicable) shall perform as well on its permanent foundation as it did on the Vendors's test stand.

The unit and its auxiliaries shall be suitable for start-up, operation and periods of idleness under the specified environmental conditions. Installation shall be outdoor without a roof, with maximum and minimum temperatures, unusual humidity, and dusty or corrosive conditions, as difened in U211-PR-DS-0006 Site and Utility DS.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

The blower's body(ies) and the e-motor shall be mounted on a single-lift skid.

8.2 Blower unit configuration

Blower unit configuration has been proposed in the unit Data sheet and in particular it's appending PID, as a guideline for Vendors design, which remains in Vendor full responsibility.

8.3 Materials

Unless otherwise specified by the Client, the materials of construction shall be selected by the Vendor based on the operating and site environmental conditions specified, and in accordance with API 673, section 2.10.

The presence of any corrosive agents (including trace quantities) in the motive and process fluids and in the site environment, including constituents that can cause stress corrosion cracking, shall be specified in datasheet.

The Vendor shall specify within the bid all proposed materials, including interconnecting pipework, and instrumentation.

The final material selection shall be subject to the Client approval.

All materials used shall be new and shall meet the requirements of the applicable Codes and fabrication Standards.

Construction materials shall be identified according to ASTM-DIN Standard. Proprietary or non-standard identification of materials shall be complemented by standard identification.

Grey cast iron shall not be used.

Asbestos shall not be used in any part of the package.

Stainless steel shall be used for the lube and control oil piping.

8.4 Welding and NDE

As per API 673. section 2.10.3, welding, including weld repairs, shall be performed by welders, welder operators and procedures qualified in accordance with the specifications of American Welding Society (AWS) D1.1 for housings and structural components and AWS D14.6 for rotating components.

For the outstanding components, such as piping the welding & Welders shall be qualified according to ASME IX or EN 287. Welding Procedures (WPS) and Welding Procedure Qualification Records (PQR) shall be submitted to Client for approval, prior to commencement of welding.

The Welding inspection and Non Destructive Examination Plan shall be mutually agreed by the Vendor and the Client. Welding inspection for the purpose of acceptance shall be performed after any post weld heat treatment. Radiographic, ultrasonic, magnetic particle and dye penetrant examination shall be performed by operators having an internationally recognized qualification according to the acceptance criteria mutually agreed.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

The reference Standard for non destructive examination shall be ASME V. Impact testing shall confirm to API 673 section 2.10.4.

8.5 Nameplates & Rotational Arrows

A nameplate shall be securely attached at a visible location on the blower frame, and on any major piece of auxiliary equipment.

Rotation arrows shall be cast in or attached to each major item of rotating equipment at a readily visible location in accordance with API 673 par 2.11.2.

Nameplates and rotation arrows (if attached) shall be of austenitic stainless steel or nickel-copper (UNS N04400 alloy). Attachment pins shall be of the same material. Welding is not permitted.

The following data, as a minimum, shall be clearly stamped or engraved on the frame.

Units used on the nameplates shall correspond to those used on the datasheets:

1. Project tag number;
2. Year of manufacture;
3. Vendor's name;
4. Model number;
5. Serial number;
6. Size.
7. Type.
8. Purchaser's equipment item number (may be listed on separate nameplate if space is insufficient)
9. Volume, inlet, in m³/h.
10. Static pressure differential, in barg (or mm H₂O).
11. Temperature, inlet, in degreesC.
12. Speed, rated, in revolutions per minute.
13. Speed, maximum allowable (at maximum allowable temperature), in revolutions per minute.
14. First critical speed, in revolutions per minute.
15. Power, rated in kW
16. WK2.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

17. Rotor weight, in kg.

The following data, as a minimum, shall be clearly stamped on the nameplate of any major piece of auxiliary equipment:

- Project tag number, if any;
- year of manufacture;
- Vendor's name;
- serial number;
- model;
- Certification marking („3A“/CE)

Nameplates shall be positioned to be clear of equipment surface or insulation by 40mm and in such a way that they can be easily read, wherever possible from grade, adjacent to a man-way or from an access platform.

Any additional information required by the Vendor or by the Client shall be defined during the detail engineering phase.

The Vendor shall reference the Project equipment and instrumentation tag numbers in its technical documentation. The Client will provide the tag numbers during the detail engineering phase.

9. ACCESSORIES

9.1 **Drivers**

Unless otherwise specified, the centrifugal blower vendor shall furnish the driver and power transmission equipment. The type of driver, as a general rule is an electric motor in compliance with API 673, but shall be as specified by the Client in the data/requisition sheet.

Driver shall operate under the utility and site conditions specified by the Client. The full flow relief condition at the discharge (see) and normal conditions at the suction shall be taken into account when sizing the driver.

The driver shall be capable of driving the blower at full flow.

The driver shall be sized to accept any specified process variations such as changes in the pressure, temperature, or properties of the air handled and plant start-up conditions.

The blower Vendor shall be responsible for the performance of the driver/blower unit.

9.2 **Electrical Motors and VFDs**

Requirements of following "Engineering Specification" shall be followed:

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

- U211-EL-SP-0013 ES for MV Motors
- U211-EL-SP-0014 ES for LV Motors.

E-motor Subsuppliers shall be subject of Client approval.

Electrical equipment protection level shall be appropriate to the hazardous area classification of the package installation.

Nevertheless the supplier have to adopt sizing and technical characteristic of the cables.

9.3 Explosion protection

Electrical equipment for installation in zone 2 hazardous area shall be suitable also for installation in Zone 1. Motors for use in zone 1 and zone 2 hazardous area shall be flameproof with an increased safety terminal box, in accordance with IEC 60079. Ex motors in increased safety (e) or non-sparking (n) execution are not acceptable.

Application of “maintenance-free” bearings (greased for the whole lifetime) is preferred against bearings with greasing nipples - if applicable.

9.4 Coupling and Guards

Unless otherwise specified, a flexible coupling shall be supplied. The coupling type, Subsupplier, model, and mounting arrangement shall be mutually agreed upon by the Client and the Vendor of the driver and driven equipment.

Guards shall be provided by the vendor for each coupling, auxiliary drive coupling and all moving parts which might be hazardous to personnel. Guards shall comply with specified applicable safety codes.

9.5 Mounting Plates

Unless otherwise specified, the blower shall be mounted on base plates. The design and method of installation on the foundation shall be mutually agreed upon.

The vendor shall furnish stainless steel shim packs between the drive equipment feet and the mounting plates. The alignment shims shall be in accordance with API 686, Chapter 7, and shall straddle the hold-down bolts and vertical jackscrews and be at least 5 mm (1/4 in.) larger on all sides than the equipment feet. No more than three shims shall be used at any location.

Baseplate shall contain the blower, drive motor, lube system. If possible, all associated piping shall be mounted on the baseplate, including suction, and discharge ducts and filters / silencers. A baseplate shall be a single fabricated steel unit, unless the Client and the Vendor mutually agree that it may be fabricated in multiple sections. Multiple-section baseplates shall have machined and doweled mating surfaces to ensure accurate field reassembly, and provisions for a sufficient number of optical leveling targets to record and repeat the required level in the field.

If the blower driver can be re-aligned after initial installation, removable vertical and horizontal driver alignment jackscrews shall be provided.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

Lugs holding these do not interfere with the installation or removal of the drive equipment and shims. Jackscrews shall be plated for rust-resistance (cadmium or other), and shall be placed in locations that do not interfere with removal of alignment shims. Motor shims shall be full bearing. Each alignment support point shall include a minimum of a ground 3mm (1/8 inch) solid stainless steel spacer and 1.5mm (1/16 inch) total various thickness stainless steel shim stock.

Baseplates shall be prepared by commercially abrasive blasting all grout contacting surfaces and shall precoat these surfaces with a inorganic zinc silicate.

The Vendor shall submit drawings and calculations of the proposed baseplate design for Client approval, before commencement of fabrication.

The baseplate shall be designed to meet allowable stress and deflection considering transportation, lifting and operating loads.

Floor plates shall have drain holes (min 16mm dia) at low points to prevent the accumulation of rainwater.

Anchor bolts for all equipment shall be supplied by the Vendor and they shall be selected according to the site and operating conditions.

Equipment mounting pads shall be machined flat and parallel after welding to baseplate supports. To prevent distortion, the machining of mounting pads shall be deferred until welding on the support base in close proximity to the mounting pads has been completed.

The baseplate shall have vertical jacking screws along the main longitudinal members with maximum intervals not exceeding 1500 mm. Anchor bolts holes shall be located in the same reinforced area as the jacking screws.

The baseplate shall be equipped with pad-type lifting eyes to accommodate a four point lift so that the complete package, including all equipments and accessories, can be lifted with a single hook.

Two grounding bosses shall be supplied, one at each opposite end of the baseplate.

Vertical lift should be assumed for the design of the pad-eyes.

9.6 Instrumentation and Control - General

The Vendor shall provide the blower control and safety system in conformance with Technical Requisition and API 673 Standards.

The controls and instrumentation shall be adequate for controlling the blower safely and efficiently at the operating conditions specified in data/requisition sheet.

9.7 Control Systems

The blower can be controlled on the basis of inlet pressure, discharge pressure, flow, or some combination of these parameters. This can be accomplished by suction throttling, valve unloaders, clearance pockets, speed variation, or a cooled bypass from discharge to suction. The control system can be mechanical, pneumatic, hydraulic, electric or electronic, or any combination thereof.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

Vendor will provide the blower control on the basis of the following as specified by the Client

- a. the type of control system (manual, automatic or programmable);
- b. the control signal;
- c. the control range;
- e. the source of the control signal and its sensitivity and range;
- f. equipment to be furnished (by the Client);
- g. speed of response required.

The blower may be controlled and anti-surge protected on the basis of inlet pressure, discharge pressure, flow, or some combination of these parameters. This may be accomplished by suction throttling, variable inlet guide vanes and discharge blowoff..

9.8 INSTRUMENTATION

The instrumentation shall conform to Instrumentation specification U211-IC-SP-0007, which is part of this Technical Requisition.

9.9 Piping and Appurtenances

Piping and installation shall first conform to the Client specifications. Unless otherwise specified, in the absence of purchaser specifications, piping shall comply with the requirements of API 673. Alternatively, all piping shall be according to EN13480 if required by certification authority.

The extent of process and auxiliary piping to be supplied by the vendor shall be as specified by the Client.

Auxiliary piping shall be in accordance with API 673. Alternatively lube oil system can conform to API 614.

All terminations up to and including 24" shall have flanges to ASME B16.5

Gaskets shall conform to ASME B16.20/ASME B16.21.

All pipework shall be adequately supported and shall have sufficient flexibility to allow for thermal expansion and contraction. Dissimilar metals shall have an effective insulating barrier fitted in between the pipe and the steel support to avoid galvanic corrosion.

Threaded connections shall not be used unless where permitted by Client requirements

All steel pipe and fittings shall be free of scale, rust, weld flux, oil, grease and other foreign materials. Interior welds of flanges and fittings shall be ground and finished to provide smooth and matching bores.

All equipment shall have provision for drainage and venting. The minimum size of drain/vent pipework and valves shall be 3/4".

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

All drains and vents to atmosphere shall be fitted with blind flanges.

Drain piping shall be separate from relief valve discharge piping and they normally are collected in a common header and routed to the edge of baseplate.

Where a piping system is connected to another piping system or to equipment of higher design rating, the higher design rating shall prevail for all piping components up to and including the first block valve in the system of the lower rating.

Piping termination points shall be grouped and supported at the edge of the baseplate.

The main piping connections shall be agreed between the Client and the Vendor.

Valves shall not be located on overhead pipe runs. Valves shall be preferably located on horizontal pipe runs and, only when strictly necessary, on vertical pipe runs.

Threading of nuts and bolts shall be in accordance with ASME B1.1.

Piping and pipe supports shall be designed and arranged to allow heat tracing and/or insulation. Any heat tracing and insulation shall be included in Vendor scope of supply (if required).

Piping and pipe supports shall be designed to meet the requirements of vibrating and pulsating service.

9.9.1 Following requirements should be understood as minimal for material certificates:

- Material certificates 3.1B according to EN 10204 shall be submitted at least for pressure-containing parts (including piping) in contact with the fluid handled if being in a service belonging to inspection category B / C (see below), for parts operating in a corrosive atmosphere and for materials not covered by recognized international standards (e.g. APIs).
- Material certificates at least 3.1A in accordance with EN 10204 shall be submitted for pressure-containing parts in a service belonging to inspection category A as well as for non-pressurized parts in contact with the fluid handled and for all auxiliary equipment and piping in non-hazardous service (e.g. lube-oil system, cooling water piping, nitrogen system, air supply...).

9.10 Air Intake filters

A dry type air intake filter silencer suitable for outdoor mounting shall be provided by vendor, unless otherwise specified. Intake filters shall be designed to suppress noise and have sufficient stiffness to prevent filter and filter housing damage due to pulsation-induced vibration.

9.11 Vibration Control

Duct expansion and vibrations can be mitigated with installation of expansion joints on blower inlet / outlet. This will be subject to vendor vibration study, but the elements shall be considered as part of scope of supply.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

9.12 Painting and coating

Painting and coating of equipment shall comply with Datasheet. Vendor's standard painting system may be proposed as an alternative, but shall be subject to Client's review and approval.

Additionally, vendor's standard **painting** procedure is acceptable (if suitable for given industrial chemical plant environmental area-class C5-I very high duration), however top coating colour shall be in accordance with enclosed Specification for Surface Preparation and Painting (RAL 6029 "mint green" for pumps, blowers, compressors, electromotors, etc.).

The Blowers Package items shall be completely shop painted (including auxiliaries and electric/instrument panels).

9.13 Earthing System

All electrical equipment supplied shall be bonded to the related skid.

Each skid shall be provided with two earthing bus bars for connecting to the main earthing system.

All non-current carrying metalwork on the skid, which is not permanently welded to the skid base, shall be bonded to the base using adequately sized earth cables.

Equipment anchor bolts shall not be used for earthing purposes.

All earthing connections shall be clearly identified on the General Arrangement Drawings and the earthing terminals shall be in accordance with the International Standards and Local Regulations.

9.14 Special Tools

When special tools and fixtures are needed to disassemble, assemble or maintain the unit, they shall be included in the quotation and furnished as part of the initial supply of the machine, together with complete instructions for their use. For multiple unit installation, the quantities of special tools and fixtures shall be agreed by the Client and the Vendor. These or similar special tools shall be used during shop assembly and post-test disassembly of the equipment.

When special tools are provided, they shall be packaged in separate, rugged metal box or boxes and marked "special tools for (tag/item number)." Each tool shall be stamped or tagged to indicate its intended use.

The equipment "Installation, Operation and Maintenance Manual" shall include a list of special tools and any special drawings or instruction on how to use such tools.

9.15 Assembly Degree

The centrifugal blower package shall be shop assembled on the baseplate and other skids, if applicable, or prefabricated to the maximum possible extent to minimize assembly at site.

A preliminary alignment, baseplate drilling and coupling installations shall be done at shop.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

All auxiliary piping shall be completely assembled within skid limits and, if necessary, prefabricated at shop and installed at site.

All the spools of the interconnecting piping shall be clearly identified.

Finish coats, where required, shall be applied at the workshop. Required insulation and cladding shall be completed at the workshop.

10. OPERABILITY AND MAINTAINABILITY

The Vendor shall provide full details for maintaining the package. Due consideration shall be given to the ease of access to all the items, during operation and maintenance, when designing the layout of the package. Access shall be provided to all equipment and any area requiring maintenance. The equipment shall be designed so that maintenance can be carried out with the minimum special facilities/tools. All equipment and piping shall be neatly arranged on the skid in such a way that they do not obstruct maintenance operations. The Vendor shall work closely with the Client to ensure that the most maintenance-effective layout is achieved for the package.

All major equipment items shall be supported on stainless steel shims at each mounting point, to facilitate re-alignment at a later stage. No tapered shims are allowed. Sufficient quantity of pre-cut shims shall be provided loose for site commissioning.

The Vendor shall provide in the proposal maintenance lifting requirements for the equipment, and shall advise suitable methods (runway beam, overhead travelling crane, etc.). The Vendor shall provide all the maintenance and analysis necessary to manage the maintenance activities.

11. WARRANTY PERIOD

The warranty period for the Goods lasts for a period of 3 years (36 months) from putting the Goods into operation, but not more than 4 years (48 months) as of the date of delivery of the Goods.

12. INSPECTION AND TESTING

12.1 **General**

Inspection and testing shall be in compliance with API 673 section 4.2 and 4.3 requirements.

Inspection test plan (ITP) for fabrication and Vendor requirements for installation of centrifugal blowers shall be prepared by Vendor following requirements within this procurement package, Serbian law and approved by Client before start of fabrication.

Acceptance of shop tests does not constitute a waiver of requirements to meet field performance under specified operations conditions, nor does inspection relieve the Vendor of his responsibilities.

Refer to the Centrifugal Blowers Package data sheets and Technical Requisition to determine the complete scope of inspection, testing and Purchaser participation therein.

The Purchaser's and the Vendor's representatives shall indicate compliance in accordance with the inspector's checklist by initialing, dating, and submitting the completed checklist to the Purchaser prior to shipment.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

Unless specified otherwise by the Client or legislative requirements, nondestructive examination (NDE) of materials shall be in accordance with PED.

Mechanical Run test procedure, Performance test procedure and FAT procedure shall be subject to client approval

12.2 PERFORMANCE TEST

If specified, the centrifugal blower unit shall be subject to a performance test both as a shop test and field test, under procedure mutually agreed between the Vendor and the purchaser, based on typical testing procedures such as AMCA Standard 210-99 and 802-92 and AMCA Publications 203-90 and 803-96.

12.3 OTHER TESTS

If specified, other tests may include optional tests from API 673, such as Complete-unit Test, Pressure test and Sound Level Test.

13. PRESERVATION, STORAGE, PACKING AND TRANSPORT

13.1.1 Vendor's standard **painting** procedure is acceptable (if suitable for given industrial chemical plant environmental area-class C5-I for long lasting period), however top coating colour according to plant standard ("mint "green RAL 6029 for all surfaces up to max. 120 °C including E-motor and base-plate; RAL 9006 "white aluminium" for hot surfaces) is required.

11.1.1 Equipment **preparation** (conservation,...) shall allow outdoor installation at Site (on the foundation; protected only by a plastic foil) for at least 6 months period of Plant erection till the equipment first start-up (see "Site & Utility Data Sheet" for climatic conditions).

In case that preservation renewal / prolongation would be required by Vendor then appropriate procedure including time schedule shall be included in Instructions for Storage. Vendor shall also specify if his supervision is required.

Equipment shall be prepared (protected, conserved ...) for oversea transportation.

11.1.2 Interior surfaces shall be thoroughly dried and preserved with suitable **rust preventative**. Type of conservation and suitable solvent shall be indicated on a tag attached on the device. Preferred type of conservation is such one, which does not require removal prior to operation.

11.1.3 All customer's **connections** shall be identified, according to markings on the general arrangement drawing, with waterproof and weatherproof labels fastened with stainless-steel wire.

11.1.4 All **openings** shall be blinded with suitable covers (fastened in such way that the cover can not be removed without a tool.) and sealed against water and dust. Flanged connections shall be provided preferably with a bolted wooden (or aluminium) cover.

Document Title:	Document No.	Rev:
Technical Requisition for API 673 Centrifugal Blowers	U211-TR-0020	00

- 11.1.5 All **valves** will be checked for operability (= hand wheels turn easily after equipment painting) and all will be at “closed” position.

If any loose equipment / accessories is to be delivered, it shall have a label with corresponding item № (to make clear to what equipment it belongs). It should be boxed separately.

11.1.6 **As a minimum, the Vendor shall:**

- prepare the supply for shipment and deliver to nominated delivery point i.e. Pancevo Oil refinery, Spoljnostarcevacka 199A, 26000 Pancevo, Republic of Serbia on DAP Incoterms 2020
- furnish internal and external shipping braces required to prevent damage or movement during transportation;
- preservation must be done for oversea transport
- furnish all the crates with relevant Packing List and Shipping Documentation;
- provide shipping, installation, operation and maintenance weights and centre of gravity;

11.1.7 The Vendor shall provide Storage and Maintenance Procedures for Client's review and approval, which shall include, as a minimum, the following subjects:

- weather protection;
- equipment storage maintenance;
- periodical inspection;
- periodical maintenance;
- notice required for equipment usage;
- corrosion protection and application of temporary coatings;
- storage conditions including temperature range and humidity.

11.1.8 Storage and Maintenance Procedures should also take in to account filling the blower accessories with nitrogen or adequate alternative for prolonged storage, preservation and transportation.

If size permits, blowers shall be shipped with complete assemblies an lifting beam attached. For flanged openings, corrosion-resistant metal tags shall be provided that locate the flanged opening in system.

Equipment shall be identified with item number, Purchaser's project number, purchase order number, and serial numbers.