



Engineering Flow Solutions

PUMPS FOR OIL & GAS DOWNSTREAM ANSI/API STANDARD 610 (ISO 13709:2009)







HMS Group offers an extensive range of state-of-the-art pumps for oil refineries, gas and condensate processing plants, petroleum & gas chemistry applications:

- **Process pumps** for primary and secondary processing stages of oil, gas and condensate as well as petroleum products:
 - Fractionation
 - Hydrocracking
 - Atmospheric distillation
 - Vacuum distillation
 - Catalytic cracking
 - Isomerization
 - Visbreaking
 - Coking
 - Demercaptanization
 - Alkylation
 - Hydrotreating
 - Reforming
 - Dehydration
 - Liquefying
- **Auxiliary pumps** for injection of crude oil, petroleum products, chemicals, catalysts and other liquids at the main process stages and handling intermediate or finished products.

The pumps are designed and manufactured in compliance with API 610 standard of 11th edition and other international and national industry standards as ISO, DIN, ANSI, ASME, NORSOK, NACE.

Engineering of pumps is performed by own R&D centers of HMS Group located in Russia, CIS and Europe with centralized management and application of the latest 3D design software based on SolidWorks, ANSYS CFX and other platforms.

Production of pumps and pumping systems is carried out at the major pumps manufacturing companies of HMS Group: APOLLO Goessnitz (Germany), HMS Livgidromash (Russia) and Bobruisk Machine Building Plant (Belarus).

The pumps supplied by HMS Group are successfully operated within years at major downstream facilities in Russia, Europe, Middle East, Africa, and Asia.

API 610 STANDARD

CENTRIFUGAL PUMPS FOR PETROLEUM, PETROCHEMICAL AND NATURAL GAS INDUSTRIES

API 610 standard, being identical to ISO 13709:2009 one, sets the requirements to centrifugal pumps regarding their reliability, safety, service & retrofit procedures as well as overall operation efficiency of the pumping system in general.

API 610 PUMPS BENEFITS & ADVANTAGES

- Service life: at least 20 years with at least 3 years of uninterrupted operation
- Pressure casing: minimum rated pressure of 4,000 kPa (40 bar/ 600 psi) at 38 °C (100 °F)
- Closed type cast impellers and high rigidity shaft
- Shaft seals according to API 682
- Flanges according to ASME/ANSI/DIN/EN
- Shaft run-out limited by 0.025 mm
- Replaceable wear rings to reduce wear of casing and axial running clearances
- Vibration limit below 3.0 mm/sec in the best efficiency point, below 3.9 mm/sec in the rest of the operating range
- Dynamic balancing of impellers:
 - Single-/two-stage pumps: ISO 1940-1 grade G1
 - Multistage pumps: flow part – ISO 1940-1 grade G1, rotor – ISO 1940-1 grade G2.5
- Bearings units lifetime: at least 25,000 hours with continuous operation at rated conditions
- Standard API-compliant baseplates for maximal alignment of pump and drive shafts to increase overall reliability of the pumping unit; the drain rims shall be provided to keep all leakages within the baseplate
- Stringent requirements to hydraulic test: pressure shall exceed the maximum allowed working pressure (MAWP) by 1.5
- External nozzles loads and moments in full compliance with API 610 11th edition requirements



OH1
OH2
OH3



BB2



BB3



BB4



BB5



VS1
VS6

FOOT/CENTRELINE/VERTICAL-MOUNTED, SINGLE-STAGE OVERHUNG PUMPS

OH1, OH2, OH3

**PUMP SERIES: KRH/KRHV/KRHA, KRHL/KGHL/
KRZ/KRZL, KRP/KRPO, KRI/KRIL, 2NK/2NKG**

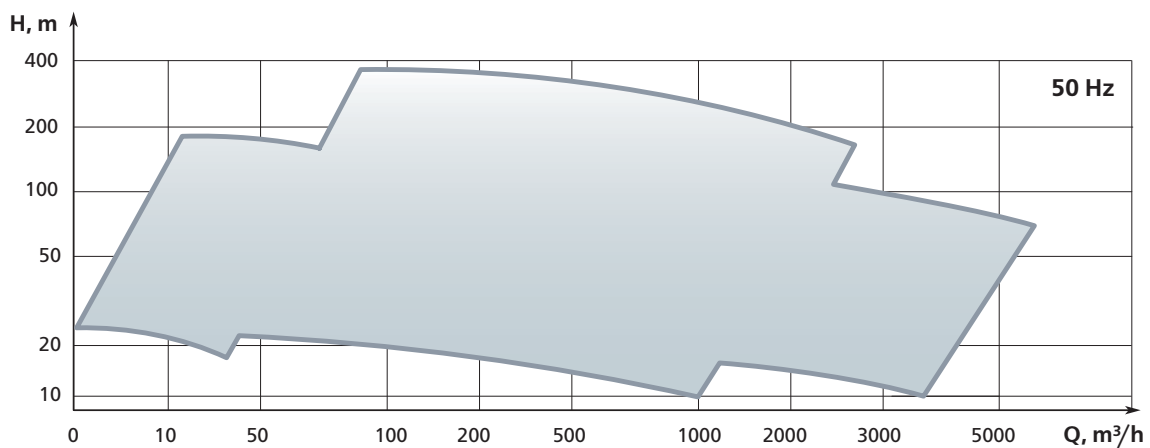
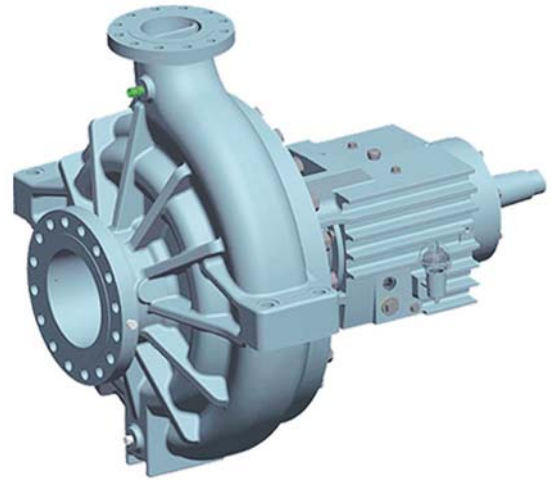
APPLICATION

Primary and secondary processing of crude oil, gas & condensate, petroleum products:

- gas fractionation
- hydrocracking
- catalytic cracking
- isomerization
- visbreaking
- coking
- demercaptanization
- alkylation
- hydrotreating
- reforming

DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
 - Mechanical seals according to API 682
 - Optional inducer for lower NPSHa
 - Versions with magnetic coupling by API 685
- Q: 3 ... 5,000 m³/h ■ H: 3 ... 390 m ■ T: -80 ... +450 °C



Selected Projects Examples	Parameters	Application & Features
Porvoo Refinery Customer: Neste Oil Finland, 2016	Q: up to 87 m ³ /h H: up to 127 m	Application: handling oil and minor products in a de-asphalting unit Features: special heating jacket on the pumps casings
Ustyurt Gas Chemical Complex Customer: Uz-Kor Gas Chemical Uzbekistan, 2014	Q: 83 m ³ /h H: 114 m	Application: handling gas condensate at ethylene production plant
Borealis Polymers Oy Customer: Neste Oil Finland, 2014	Q: 202 m ³ /h H: 316 m	Application: handling C4-hydrocarbon in polymers production processes

RADIALLY SPLIT, ONE- AND TWO-STAGE, BETWEEN-BEARINGS PUMPS

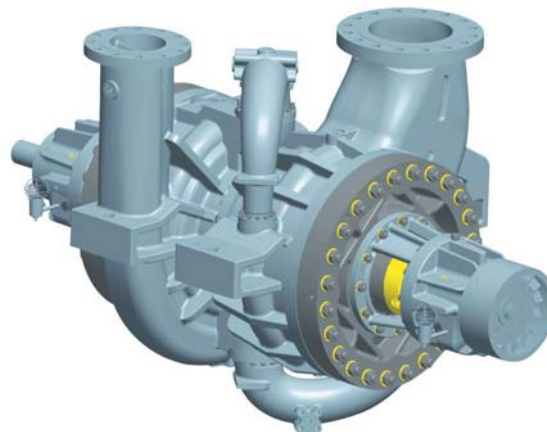
BB2

PUMP SERIES: ZPR/ZPRA, KGR/KGRD

APPLICATION

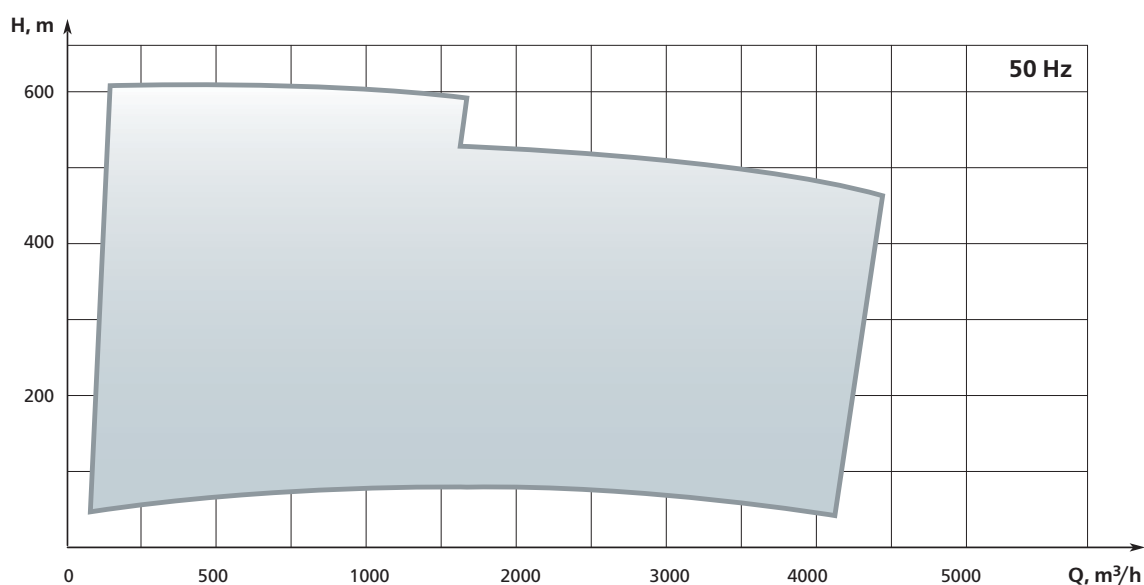
Primary and secondary processing of crude oil, gas & condensate, petroleum products:

- gas fractionation
- atmospheric distillation
- vacuum distillation
- hydrocracking
- catalytic cracking
- isomerization
- visbreaking
- demercaptanization
- alkylation
- hydrotreating
- reforming



DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
 - Seals according to API 682
 - Back-to-back impellers
- Q: 3 ... 4,000 m³/h
 ■ H: 25 ... 600 m
 ■ T: -80 ... +450 °C



Selected Projects Examples	Parameters	Application & Features
Condensate Stabilization Unit For Achimov Horizon Deposits Customer: Gazprom Russia, 2015	Q: up to 350 m ³ /h H: up to 270 m	Application: handling deethanized and stabilized gas condensate Features: pumps designed to withstand liquids temperature up to +325 °C
Ryazan Oil Refinery Customer: Rosneft Russia, 2013	Q: 657 m ³ /h H: 315 m	Application: handling crude oil in refining processes
Khabarovsk Oil Refinery Customer: IPC-Khabarovsk Refinery Russia, 2013	Q: 1,380 m ³ /h H: 200 m	Application: handling diesel fuel fractions

AXIALLY SPLIT, MULTISTAGE, BETWEEN-BEARINGS PUMPS

PUMP SERIES: AMG/NPS

APPLICATION

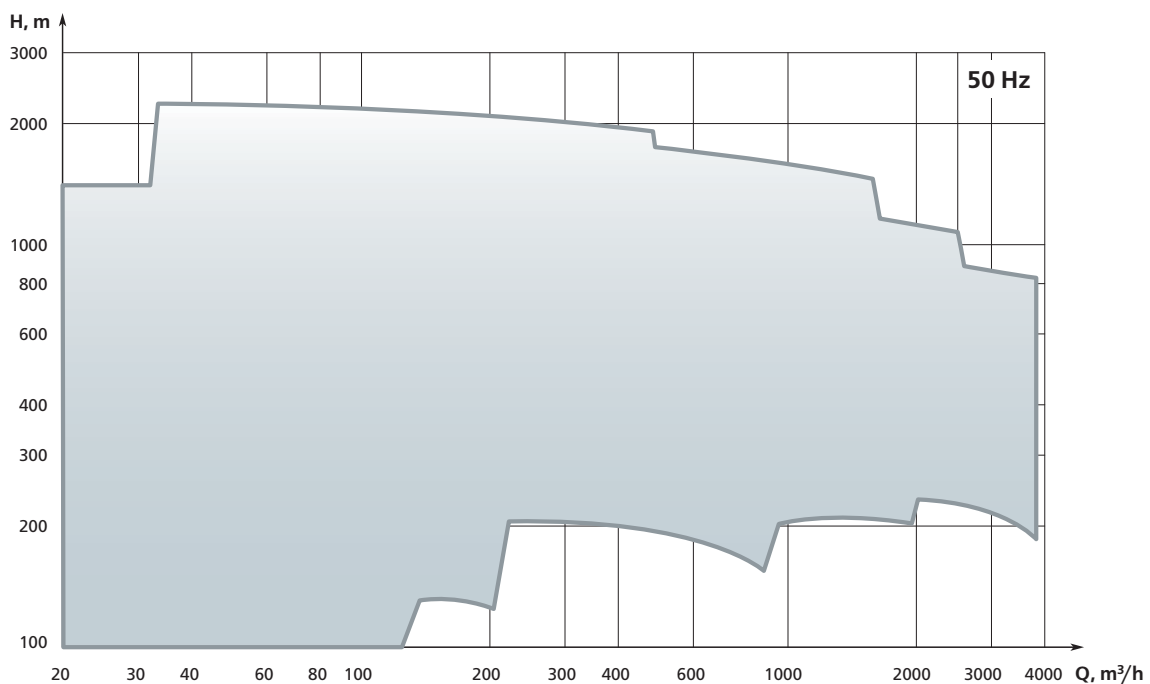
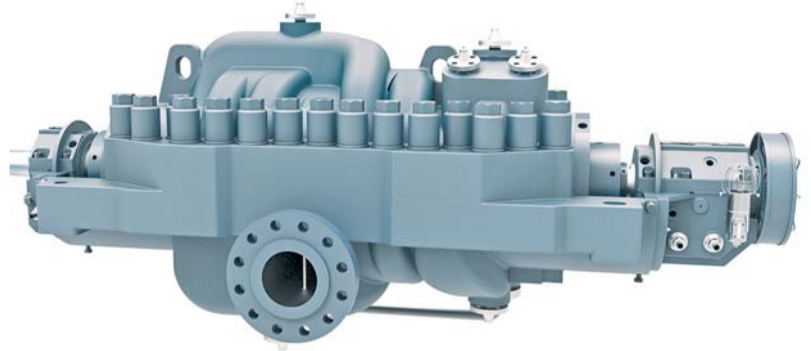
Secondary processing of crude oil, gas & condensate, petroleum products:

- catalytic cracking
- isomerization

DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
- Seals according to API 682
- Interchangeable rotors for different capacities

- Q: 32 ... 3,700 m³/h
- H: 150 ... 1,900 m
- T: -80 ... +250 °C



Selected Projects Examples	Parameters	Application & Features
Gas Condensate Stabilization Unit Customer: Gazprom Russia, 2016	Q: 200 m ³ /h H: 700 m	Application: handling gas condensate and light hydrocarbons in treatment processes Features: 12% chromium steel pumps material
Urengoy Condensate Treatment Plant Customer: Gazprom Russia, 2014	Q: 200 m ³ /h H: 700 m	Application: handling deethanized gas condensate in treatment process Features: carbon steel pumps material
Saratov Oil Refinery Customer: Rosneft Russia, 2013	Q: 65 m ³ /h H: 500 m	Application: handling +140 °C petroleum products in catalytic cracking unit Features: 12% chromium steel pumps material

SINGLE-CASING, RADIALLY SPLIT, MULTISTAGE, BETWEEN-BEARINGS PUMPS

BB4

PUMP SERIES: HP/GP, GH, GMHD, NM, CNSn

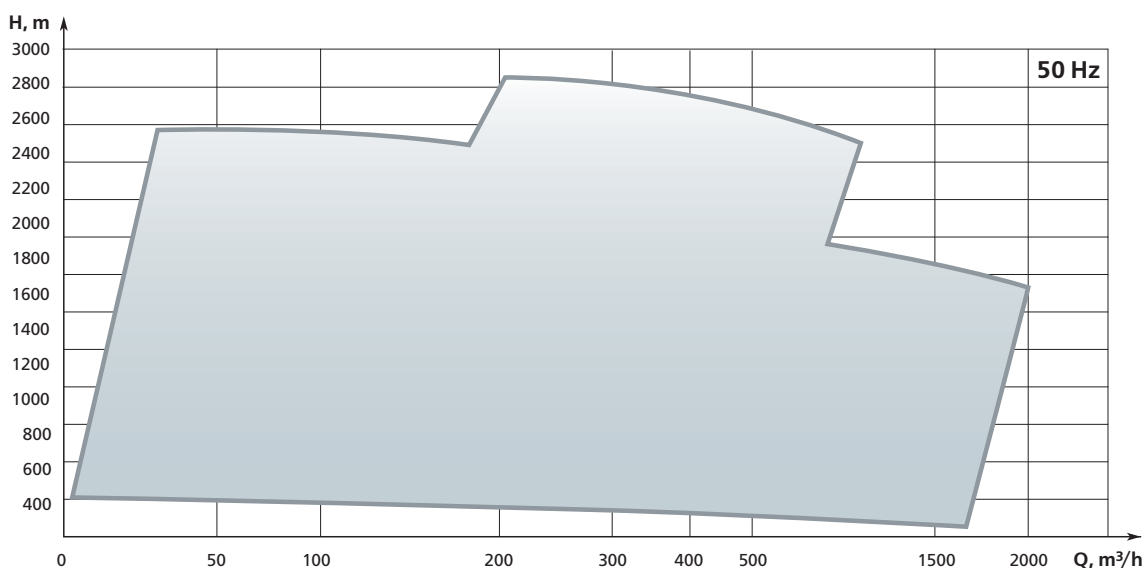
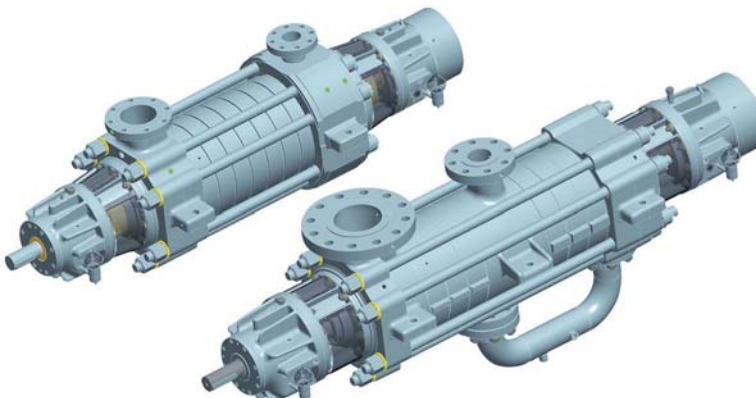
APPLICATION

Injection of crude oil, gas condensate, petroleum products, chemicals, catalysts and other liquids at the main process stages

DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
- Seals according to API 682
- Interchangeable impellers for different capacities
- Back-to-back or inline impellers
- Double suction impellers or inducer at the first stage (optional) for lower NPSHa

■ Q: 10 ... 1,400 m³/h ■ H: 80 ... 2,800 m ■ T: -80 ... +200 °C



Selected Projects Examples	Parameters	Application & Features
Novokuibyshev Lubricants and Additives Plant Customer: Rosneft Russia, 2014	Q: 220 m ³ /h H: 669 m	Application: handling diesel fraction
Fertilizers Plant Customer: Bagfas Bandirma Turkey, 2013	Q: 75 m ³ /h H: 694 m	Application: handling boiled demineralized water in various fertilizers production process
TDI Production Facilities Expansion Project Customer: Daewoo Engineering/ KPX Fine Chemical South Korea, 2010	Q: 27 m ³ /h H: 399 m	Application: handling toluene di-isocyanate (TDI) and toluene diamine (TDA) mixtures Features: stainless steel pumps material

DOUBLE-CASING, RADIALLY SPLIT, MULTISTAGE, BETWEEN-BEARINGS PUMPS

BB5

PUMP SERIES: TL/TG, NM, TGX/TGDX, CNSDp

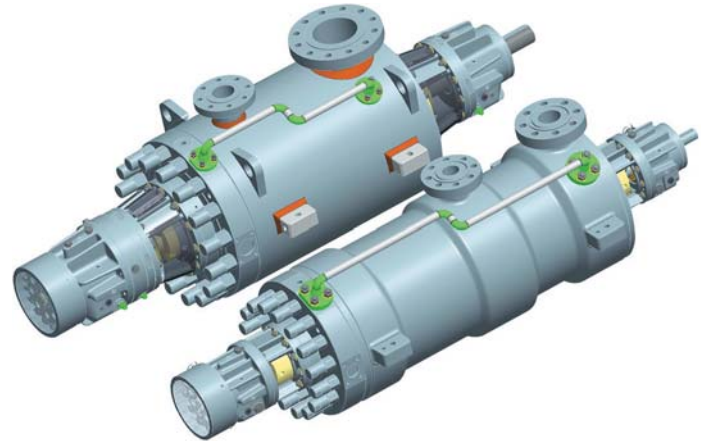
APPLICATION

Primary and secondary processing of crude oil, gas & condensate, petroleum products:

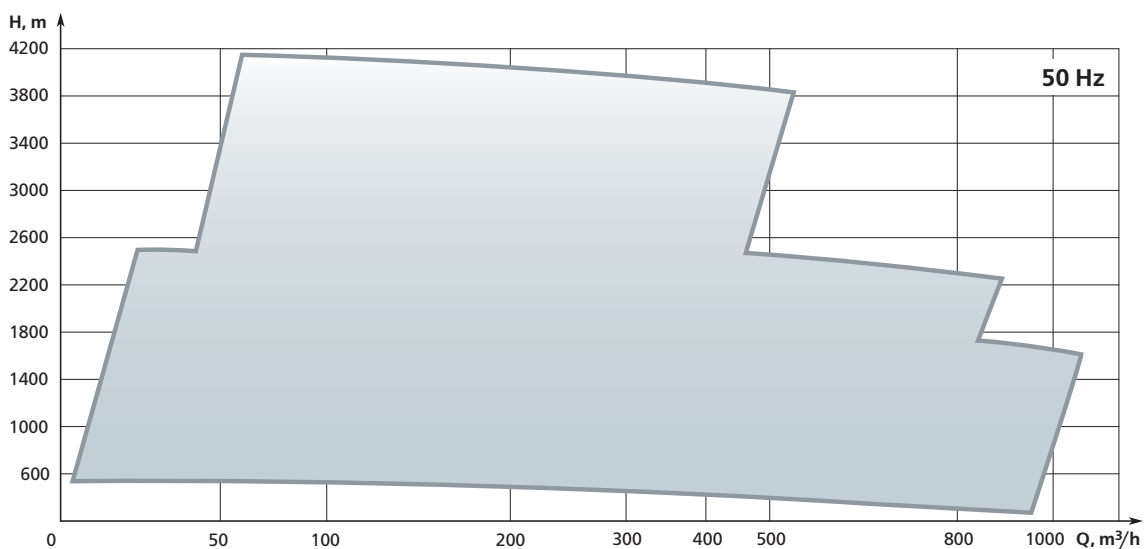
- gas fractionation
- demercaptanization
- visbreaking
- alkylation
- coking
- reforming

DESIGN FEATURES

- Flanges according to ASME/ANSI/DIN/EN
- Pump dismantling without separation off the pipeline
- Seals according to API 682
- Back-to-back or inline impellers
- Double suction impeller or inducer at the first stage (optional) for lower NPSHa



- Q: 8 ... 1,000 m³/h
- H: 180 ... 4,200 m
- T: -80 ... +450 °C



Selected Projects Examples	Parameters	Application & Features
Porvoo Refinery Customer: Neste Oil Finland, 2016	Q: 1,528 m ³ /h H: 515 m	Application: handling +265 °C process solvent in a de-asphalting unit Features: pumps supplied in skid-mounted versions; inline-arranged impellers; separate skid of lube oil system
Oil Refining and Petrochemical Complex Customer: TANEKO (Tatneft) Russia, 2014	Q: up to 1,184 m ³ /h H: up to 1,633 m	Application: handling heavy gasoil, water-amine solution, light hydrocarbons, H ₂ S-contained water
Novokuibyshev Lubricants and Additives Plant Customer: Rosneft Russia, 2013	Q: 98.5 m ³ /h H: 2,620 m	Application: handling +146 °C paraffin products Features: pumps operation through a gear multiplier at 4400 rpm; carbon steel pumps material

SINGLE- AND DOUBLE-CASING, DIFFUSER, VERTICALLY SUSPENDED PUMPS

VS1, VS6

PUMP SERIES: HPV/HPTV/HPVX, GSTV/GLKV, GDV/GDTV, NOU, NPV/NPV-M, NMV

Application

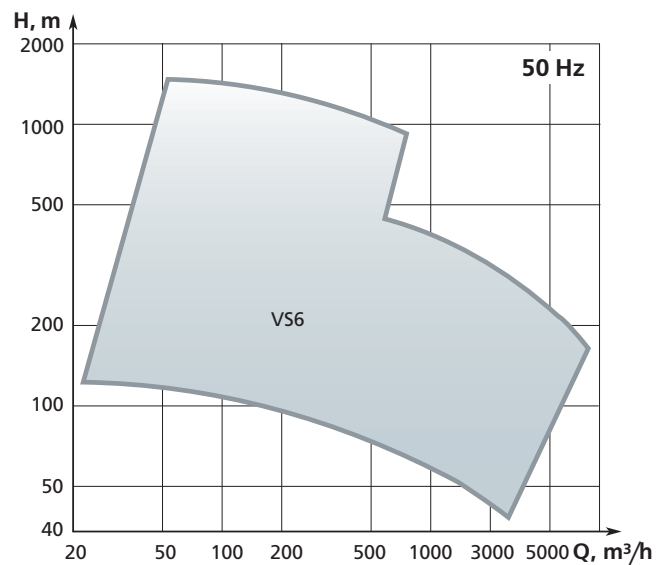
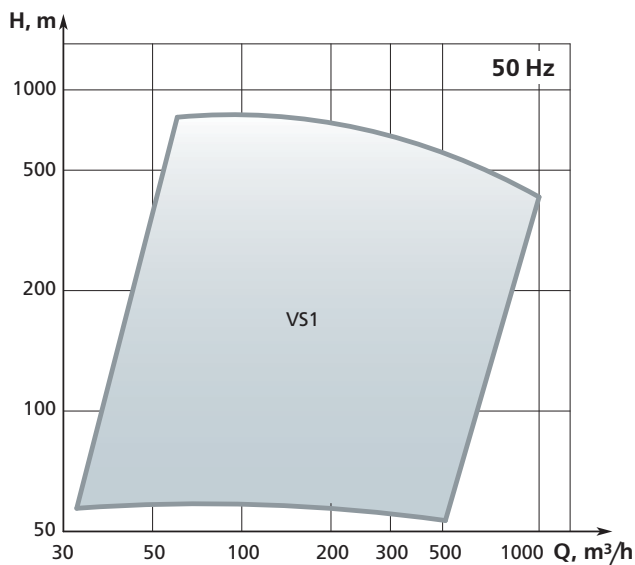
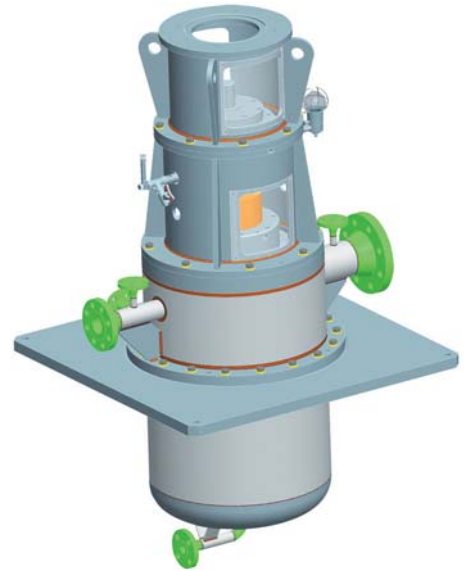
Primary and secondary processing of oil, gas & condensate, petroleum products:

- gas fractionation
- demercaptanization
- visbreaking
- reforming

Design features

- Flanges according to ASME/ANSI/DIN/EN
- Seals according to API 682
- Single/double suction impellers
- Double suction impeller or inducer in the first stage (optional) for lower NPSHa

- Q: 6 ... 5,000 m³/h
- H: 6 ... 1,600 m
- T: -180 ... +260 °C



Selected Projects Examples	Parameters	Application & Features
Iowa Fertilizer Plant Customer: Iowa Fertilizer Company USA, 2014	Q: 66 m ³ /h H: 120 m	Application: handling process condensate in fertilizers production
Yara Suomi Refinery Customer: Yara Suomi Oy Finland, 2014	Q: 32 m ³ /h H: 177 m	Application: handling ammonia liquids in various processes Features: pumps designed to withstand liquid temperature down to -33 °C
Central Processing & Storage Facility Customer: Dragon Oil Turkmenistan, 2014	Q: 40 m ³ /h H: 87.5 m	Application: handling condensate, process water and crude oil in treatment processes Features: VS6 type multistage pumps of can-type version

MATERIAL CLASSES FOR PUMP PARTS ACCORDING TO API 610 11TH EDITION

Pump Parts	Materials Classes						
	I-1	I-2	S-1	S-3	S-4	S-5	S-6
Casing	Cast iron	Cast iron	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel
Inner Casing Parts	Cast iron	Bronze	Cast iron	Ni-Resist	Cast iron	Carbon steel	12 % CR
Shaft	Carbon steel	Carbon steel	Carbon steel	Carbon steel	Carbon steel	4140 alloy steel	4140 alloy steel
Impeller	Cast iron	Bronze	Cast iron	Ni-Resist	Carbon steel	Carbon steel	12 % CR

Pump Parts	Materials Classes						
	S-8	S-9	C-6	A-7	A-8	D-1	D-2
Casing	Carbon steel	Carbon steel	12 % CR	AUS	316 AUS	Duplex	Super Duplex
Inner Casing Parts	316 AUS	Ni-Cu alloy	12 % CR	AUS	316 AUS	Duplex	Super Duplex
Shaft	316 AUS	Ni-Cu alloy	12 % CR	AUS	316 AUS	Duplex	Super Duplex
Impeller	316 AUS	Ni-Cu alloy	12 % CR	AUS	316 AUS	Duplex	Super Duplex

SCOPE OF SUPPLY*

- Pump according to API 610 with coupling and counter flanges
- Drive: electric motor by SIEMENS, ABB or customer-approved manufacturer
- API 682 compliant shaft seals with specified flushing plans
- Sensors, automation and instrumentation as required
- First fill lubrication, grease, etc.
- Spare parts & tools for installation, commissioning, operation, and maintenance
- Auxiliary piping, bolts, nuts, washers, gaskets

* The scope of supply is the subject to specific supply conditions

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