www.smpump.co.kr

SM INDUSTRY

Submersible pump with auxiliary motor equipped
with impeller sticking prevention and diagnostic functions

Submersible pump / Land pump /
Water treatment machine / Machine and facility work

New disaster protection safety technology No. 2022-38-01

수중모터펌프
에스엠산업

CONTENTS

SUBMERSIBLE PUMP

SM Industry aims to repay customers'
support with the best technology and quality.

66

We would like to become a company that moves forward without fear of any difficulties for a better tomorrow.

99

Executives and employees
of SM Industry

SM Industry sincerely fulfills its role as a guardian of the Earth's environment by producing and providing environmental and water-related products to customers in preparation for environmental changes, weather events and climate abnormalities.

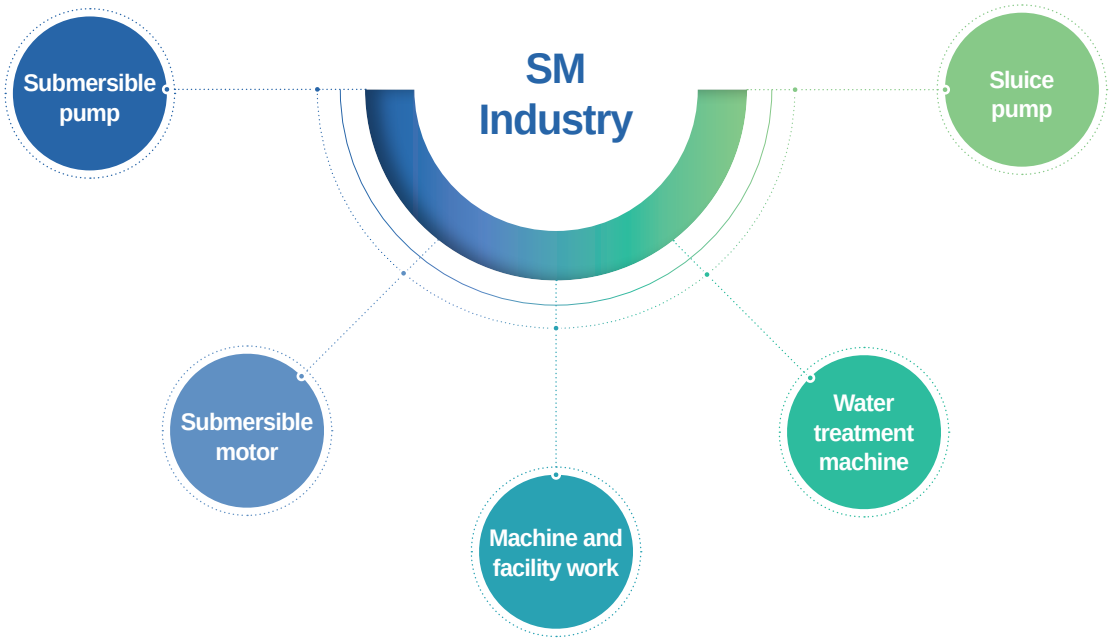
In addition, we strive to produce and supply high-efficiency, low-energy consumption products while provide customized optimal services to our customers.

SM Industry is not satisfied with the reality but wants to become a company that moves forward without fear of any difficulties for a better tomorrow. We wants to become the cornerstone that opens a new world through continuous R&D and a tireless spirit of challenge.

We will do our best to become a company that grows together with customers and shares value with them by developing, producing, and providing products that meet their needs.

We ask for continued affection and interest of our customers.

Business Areas



Organization

HISTORY

SM Industry produces first-class products
through accumulated know-how and advanced technology.

2013

- Established SM Industry (Gunsan Industrial Complex)
- Registered the factory and started to produce the submersible pump

2014

- 2008: Acquired ISO 9001 certification
  ⇨ 2015: Renewed ISO 9001 certification (2017.10.26.)
- Acquired certification of a direct production company
- Acquired certification of a venture business

벤처확인기업
Venture Enterprise

2016

- Acquired the patent for variable blade angle pump
- Relocated SM Industry
  (Gimje Jipyeong Industrial Complex)
- Acquired the certificate of
  company-affiliated research institute
- Achieved first overseas export

2017

- Acquired the quality certification Q Mark from KTC
- Registered 4 patents for blade angle, rotor blade with variable function and the pump equipped with combination structure
- Acquired INNOBIZ certification

2018

- Introduced work-study parallel education
- Obtained a professional construction license (machine and facility)

일학습병행
KOREA DUAL PROGRAM

SM Industry wants to become the cornerstone that opens a new world through continuous R&D and a tireless spirit of challenge. We strive to provide our customers with customized and optimal services by producing environmental products and water-related products in preparation for environmental changes, extreme weather events, and climate abnormalities.

2019

- Performance Certification
- Obtained KS product certification

2020

- Designated as an excellent procurement joint branded product
- Registered the patent for a screener that expands fluid flow and screening effects
- Acquired certification for a pilot purchase of technology development product.

2021

- Certified as a promising SME of Jeonbuk

2022

- Registered a patent for a submersible pump with a function to prevent impeller sticking
- Acquired a new technology for disaster protection (NET)
- Acquired a new product (NEP)
- Acquired certification for a high-efficiency energy equipment

2023

- Introduced a smart factory
- Awarded a commendation from the Minister of SMEs and Startups

중소벤처기업부

Certification and patent

Certificates

Business license

Factory registration certificate

Construction business registration certificate

Certificate of Technology Innovative INNOBIZ

ISO 9001

KS product certificate

Certificate of Company-affiliated research institute

Certificate of Venture business

Membership card of Korea Industrial Technology Association (KOITA)

Certificate of Quality

Certificate of Performance

Certificate of Designated Excellent Procurement Joint Branded Product

Certificate of High-efficiency energy equipment

Certificate of New Product (NEP)

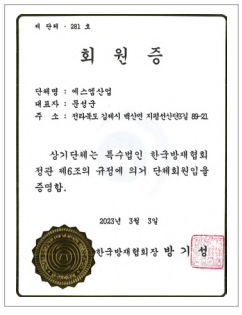
Commendation from the Minister of SMEs and Startups

Certificate of SME

Certificate of New Technology for Disaster Protection (NET)

Certificate of Pilot Purchase of technology development product

Trademark [JSM]



Membership Card of Korea Disaster Prevention Association (KDPA)

Patent

Patent certificates①

Patent certificates②

Patent certificates③

Patent certificates④

Patent certificates⑤

Patent certificates⑥

Others

Certificate of Direct Production①

Certificate of Direct Production②

Certificate of Direct Production③

Certificate of Direct Production④

Certificate of Direct Production⑤

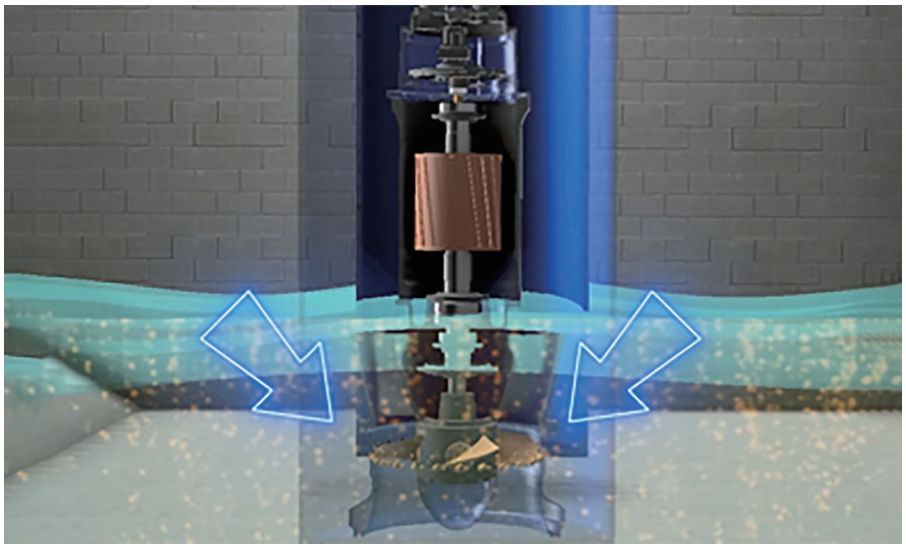
Certificate of Direct Production⑥

Certificate of Direct Production⑦

Technology development products

Background of technology development

Occurrence of impeller sticking

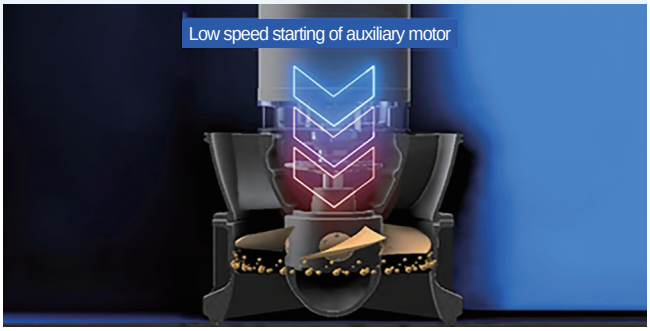


Problems of existing submersible pumps

❶ When the submersible pump is not in operation for a long period of time, sticking occurs between the impeller and the wear ring, and the submersible pump does not operate in an emergency situation.
❷ The submersible pump does not operate since the main power has been cut off during the non-operation period.
❸ If the submersible pump does not operate in a timely manner, disasters such as casualties and flooding may result.
❹ Repair and maintenance costs incur due to the motor damage by impeller sticking.

Key contents of the patent

❶ By applying a magnetic clutch, both the main motor and auxiliary motor can be operated independently.
❷ By operating the auxiliary motor (BLDC) without operating the main motor, diagnostic function such as finding impel ler sticking can be performed.
❸ The technology to manufacture the auxiliary pump that can be installed on the existing submersible motor pump



Impeller sticking


1


2


3


4

Patent-related test reports

❶ First test report

· Certification agency: Korea Testing Certification Institute (KTC)
· Application date: 2021. 06. 30
· Test date: 2021. 06. 30 ~ 2021. 11. 05
· Sample: Sewage pump (150A), Mixed flow pump (1200A)

❷ Second test report

· Certification agency: Korea Testing Certification Institute (KTC)
· Application date: 2022. 05. 04
· Test date: 2022. 05. 04 ~ 2022. 07. 04
· Sample: Gate pump (1000A), Axial flow pump (800A)

Solve the problems using new technologies

- The technology for mounting an auxiliary motor system on the main motor shaft inside the pump
  - The pump can be operated at low speed without water.
  - Prevent sticking between pump impeller and wearing ring
  - Prevent solidification of pump bearings and maintains performance.
  - Prevent disaster accident by normal operation of the pump.

* This is an important technology that prevents flooding accidents due to pump failure in emergency situations by preventing impeller sticking and bearing solidifying, and prevents property damage and human casualties in heavy rain areas.

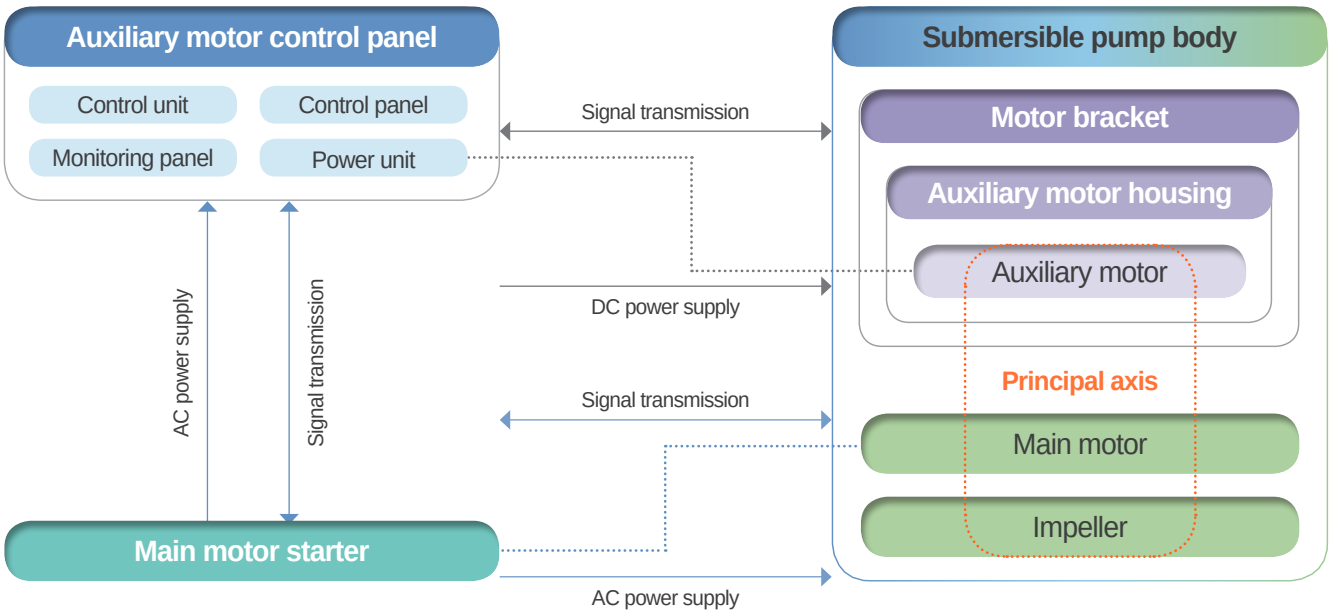
Technology development products

Main parts configuration diagram

The submersible jump equipped with auxiliary motor applying functions to prevent and diagnose the impeller sticking.

- ❹ Auxiliary motor control panel
- ❸ Auxiliary motor parts
  - BLDC motor
  - Reducer
  - Clutch
- ❷ Main motor parts
  - Motor body
  - Thrust bearing
  - Shaft seal unit
  - Power cable
  - Control cable
- ❶ Pump parts
  - Impeller
  - Shaft
  - Casing

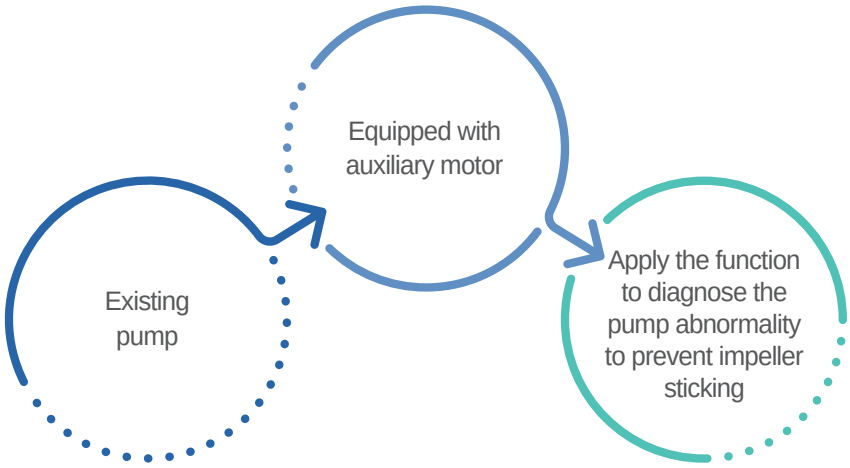
Operation principle diagram



Auxiliary motor system

"This is a new disaster safety technology which uses an auxiliary motor system to minimize the possibility of product defects through periodic operation of the pump and prompt maintenance even when there is no water.
It always maintains the pump in normal condition in case of an emergency helping safety against disaster."

The pump with patented technology



❶ Apply an auxiliary motor and clutch to the main motor shaft

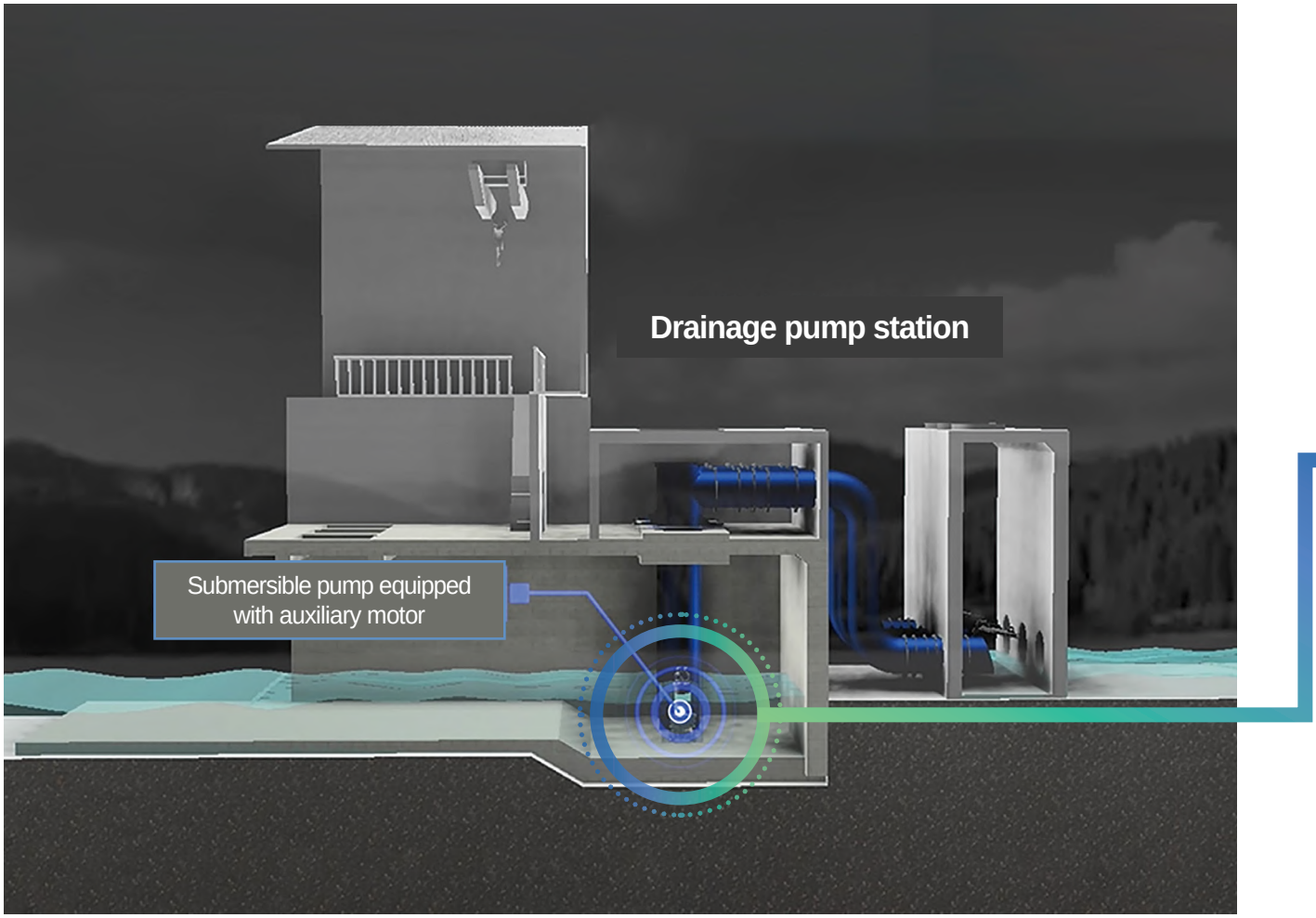
- Developed technology to attach an auxiliary motor (BLDC=Brushless DC Motor) to an existing pump
- Applied the clutch and sensor between the main motor and auxiliary motor

❷ Apply the pump abnormality diagnosis functions such as impeller sticking prevention

- Developed a PLC application program to implement the function to diagnose the sticking of the impeller foreign matters
- Developed an auxiliary motor and its control system applying the function to prevent and diagnose the impeller sticking.

Technology development products

Drainage pumping station applying technology to prevent sticking

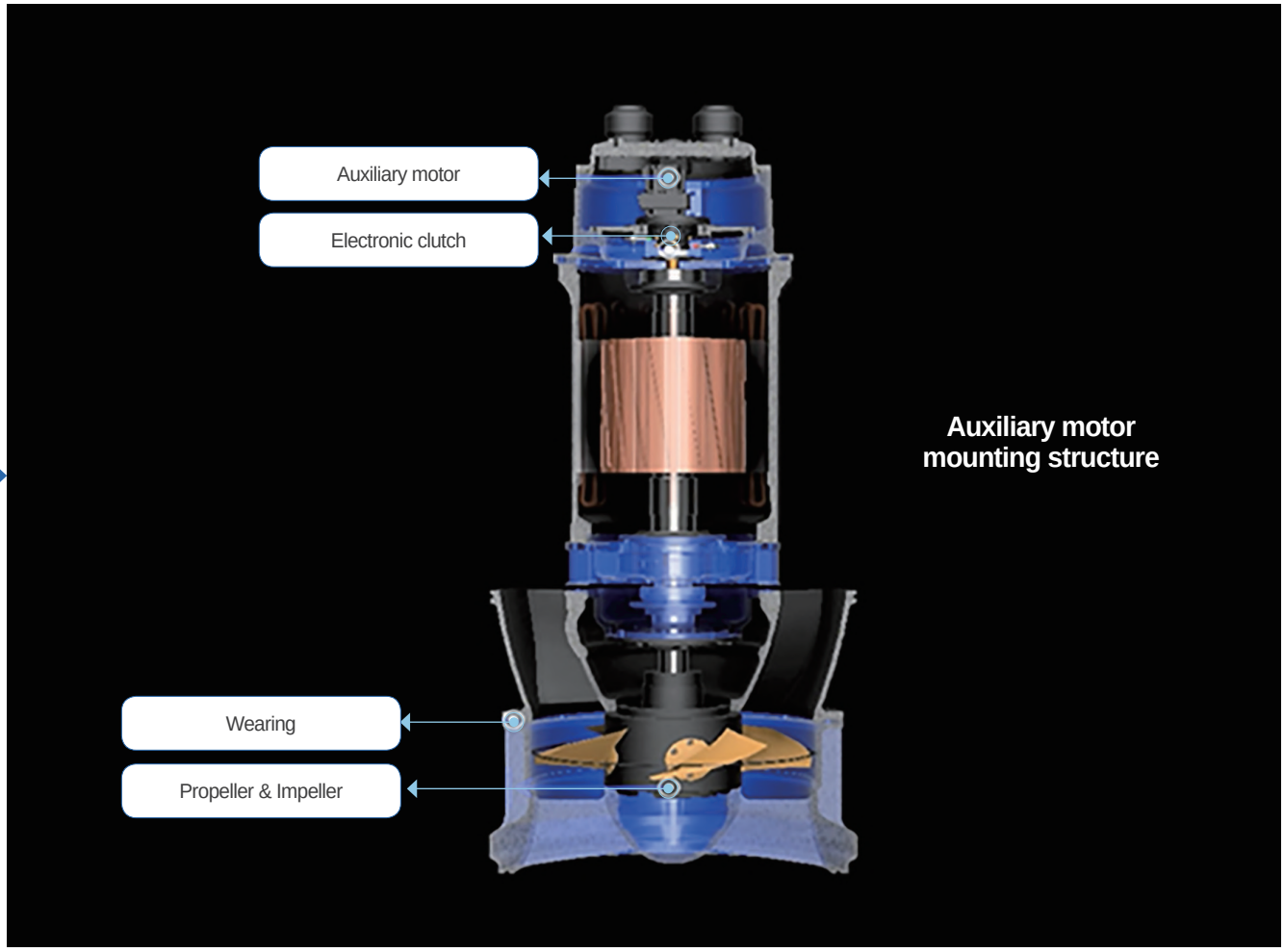


※ Features of technology

❶ Submersible motor pump system technology equipped with a BLDC auxiliary motor containing a reducer, which solves the problems of foreign matter being caught in the submersible pump and impeller sticking.

❷ Technology to manufacture the pump that can be installed on all types of submersible motor pumps, such as drainage pumps and sewage pumps, without changing the design of existing submersible motor pumps.

❸ Patented pump manufacturing technology and is a world-leading pump manufacturing technology to prevent pump impeller sticking.



Expected effects of pumps applying patented technology

1. Solve the problem of foreign substances sticking to the impeller of existing pumps.
2. Secure economic feasibility by reducing maintenance costs by preventing loss or damage to large pumps.
3. By operating the pump at all times in an emergency, casualties and material damage can be prevented in disaster situations.
4. Reduces repair and maintenance costs (A/S).
5. Easy maintenance when the submersible pump is not in operation (during winter season).
6. Expand opportunities to export drainage pumping facilities to regions with heavy rainfall, such as Southeast Asia.

Products

Land pump

SPS

Single suction volute pump

SCP

Large capacity volute pump

SMT

Vacuum pump

SMV

Multi-stage (turbo) volute pump

SDV

Double suction volute pump

SVPL

Vertical Mixed Flow Pump

SCS

Screw centrifugal pump

SVPL

Vertical Axial flow Pump

SIL

Inline pump

Products

SG

Gear pump

SSP

Self-priming pump

SBS

Water pressurization booster pump

Submersible pump

SGA

Gate pump

SPL

Submersible Axial flow pump

SWM

Submersible Mixed flow pump

SWO

Sewage Pump

SSE

Large Capacity Drainage Pump

SSV

Vortex Pump

Products

Submersible pump

SGP
Sand Pump

SDO
Construction pump

SDH
High head pump

SSN
Spurt submersible pump

SGPN
Fish farm pump

SR
Internal return pump

Other water treatment machines

SAO
Aerator (forced air supply type)

SM
Stirrer

SRO
Aerator

Other water treatment machines

Screen (Fine/Micro screen)

Screener (Rotary type)

Diffuser

Hopper

1. Screen: Continuously removes relatively small contaminants from the sewage treatment plant.
2. Screener: Removes impurities caught in the waterway along with the inflow water.
3. Air diffuser: Micro bubble type with excellent oxygen delivery efficiency.
4. Hopper: Designed in a sealed form to prevent bad odors and make it easy to carry out.

Products

Submersible pump

Mixed Flow Pump

Applications

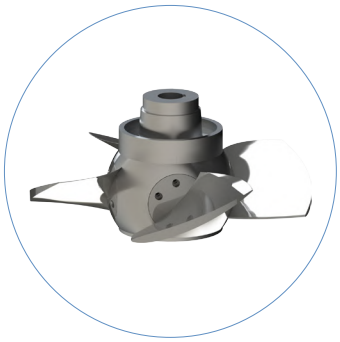
- For sewage and wastewater
- Widely used in waterworks and sewage treatment plants
- Prepare for water discharge in case of flood or heavy rain
- Apply to a variety of applications due to its high head and high flow rate design.

NO.	Product name	Diameter	Power	Head	Flow rate
	Submersible Mixed Flow Pump	(mm)	(kW)	(m)	(m^3/min)
1	350SWM30T	350	30	7	15
2	400SWM45T	400	45	8	20
3	400SWM55T	400	55	10	20
4	500SWM55T	500	55	6.5	30
5	500SWM75T	500	75	8.5	30
6	500SWM90T	500	90	11	30
7	600SWM75T	600	75	6.5	45
8	600SWM90T	600	90	7.5	45
9	600SWM110T	600	110	9	45
10	700SWM90T	700	90	6	60
11	700SWM110T	700	110	7	60
12	700SWM150T	700	150	10	60
13	800SWM110T	800	110	6	80
14	800SWM150T	800	150	7.5	80
15	800SWM190T	800	190	9.5	80
16	800SWM250T	800	250	12	80
17	900SWM150T	900	150	6	100
18	900SWM190T	900	190	7.5	100
19	900SWM250T	900	250	10	100
20	900SWM300T	900	300	12	100
21	1000SWM190T	1000	190	6.5	120
22	1000SWM250T	1000	250	8.5	120
23	1000SWM300T	1000	300	10	120
24	1000SWM350T	1000	350	12	120
25	1100SWM250T	1100	250	7	140
26	1100SWM300T	1100	300	8.5	140
27	1100SWM350T	1100	350	10	140
28	1200SWM250T	1200	250	6	170
29	1200SWM370T	1200	370	9	170
30	1200SWM400T	1200	400	9.5	170
31	1350SWM450T	1350	450	9	210
32	1500SWM520T	1500	520	8	260
33	1500SWM550T	1500	550	9	260
34	1650SWM620T	1650	620	8	320
35	1800SWM770T	1800	770	8.5	380
36	1800SWM850T	1800	850	9.4	380
37	2000SWM1000T	2000	1000	9.5	450

Products

Submersible pump

Axial Flow Pump



Applications

- For sewage and drainage
- Mainly used for places where head is low and flow rate is high.
- For drainage of rainwater from flooding, rainwater, etc.
- Apply high-efficiency propeller impeller with low head and high flow rate

NO.	Product Name	Diameter	Power	head	Flow rate
	Submersible Axial Flow Pump	(mm)	(kW))	(m)	(m^3/min)
1	350SPL30T	350	30	5	15
2	400SPL37T	400	37	5	20
3	400SPL55T	400	55	8	20
4	500SPL45T	500	45	5	30
5	500SPL55T	500	55	6	30
6	500SPL75T	500	75	7	30
7	500SPL90T	500	90	8	30
8	600SPL55T	600	55	5	45
9	600SPL75T	600	75	6	45
10	600SPL90T	600	90	7	45
11	700SPL75T	700	75	5	60
12	700SPL90T	700	90	6	60
13	700SPL150T	700	150	8	60
14	800SPL90T	800	90	5	80
15	800SPL110T	800	110	6	80
16	800SPL132T	800	132	7	80
17	800SPL150T	800	150	8	80
18	900SPL90T	900	90	5	100
19	900SPL110T	900	110	6	100
20	900SPL150T	900	150	7	100
21	900SPL190T	900	190	8	100
22	1000SPL110T	1000	110	3	120
23	1000SPL150T	1000	150	5	120
24	1000SPL200T	1000	200	6	120
25	1000SPL250T	1000	250	7	120
26	1100SPL150T	1100	150	4	140
27	1100SPL200T	1100	200	5	140
28	1100SPL250T	1100	250	6	140
29	1200SPL200T	1200	200	4	170
30	1200SPL250T	1200	250	6	170
31	1200SPL300T	1200	300	7	170
32	1350SPL200T	1350	200	3.5	210
33	1350SPL250T	1350	250	4.5	210
34	1350SPL300T	1350	300	5.5	210
35	1500SPL250T	1500	250	3.5	260
36	1500SPL300T	1500	300	4.5	260
37	1500SPL330T	1500	330	5	260
38	1650SPL400T	1650	400	5	320
39	1650SPL450T	1650	450	5.7	320
40	1800SPL530T	1800	530	5.5	380
41	1800SPL600T	1800	600	6.5	380
42	1800SPL750T	1800	750	8	380

Products

Submersible pump

Gate Pump

Applications

- For rainwater drainage and sluice drainage
- For reservoir sluice drainage
- For regulating river water levels
- Separate installation space is not required due to integrated sluice pump

NO.	Product Name	Diameter	Power	Gate(B)	Gate(H)	Head	Flow rate
	Gate Pump	(mm)	(kW)	(mm)	(mm)	(m)	(m^3/min)
1	400SGA30T	400	30	1500	1500	4.5	20
2	500SGA37T	500	37	1700	1500	4	30
3	600SGA55T	600	55	1900	1500	4	45
4	700SGA75T	700	75	2000	1500	4	60
5	800SGA110T	800	110	2000	2000	4.5	80
6	900SGA130T	900	130	2500	2000	4.5	100
7	1000SGA150T	1000	150	2500	2500	4.5	120
8	1200SGA170T	1200	170	3000	2500	3.6	170
9	1350SGA220T	1350	220	3500	3000	3.8	210
10	1500SGA250T	1500	250	4000	3500	3.5	260
11	400SGA30 x 2T	400	30 x 2	2000	1500	4.5	20
12	500SGA37 x 2T	500	37 x 2	2000	1500	4	30
13	600SGA55 x 2T	600	55 x 2	2500	1500	4	45
14	700SGA75 x 2T	700	75 x 2	3200	1500	4	60
15	800SGA110 x 2T	800	110 x 2	3500	2000	4.5	80
16	900SGA130 x 2T	900	130 x 2	3500	2000	4.5	100
17	1000SGA150 x 2T	1000	150 x 2	4500	2500	4.5	120
18	1200SGA170 x 2T	1200	170 x 2	5000	2500	3.6	170
19	1350SGA220 x 2T	1350	220 x 2	5000	4000	3.8	210
20	1500SGA250 x 2T	1500	250 x 2	7000	4000	3.5	260

Manufacturing equipment

Manufacturing equipment list

NO.	Equipment number	Equipment name	Specification	Quantity	Manufacturer	Model name	Acquisition year
1	SM-M-001	Milling	1000*300mm	1	Namsung	STM-2VA	October 2016
2	SM-M-002	Engine lathe	400*1060mm	1	Tongil	SM05-941	November 2016
3	SM-M-003	Balancing machine	300kg	1	Hanbando	JV-10D	November 2016
4	SM-M-004	Drilling machine	13~19mm	2	YoungGwang	GTD-410-M	October 2016
5	SM-M-005	Bearing heater	Ø30~Ø300	1	Eugene Corporation	YB-300DTG	April 2018
6	SM-M-006	Over head crane	5ton	1	Bando Cranes	BD-16-03-2	September 2016
7	SM-M-007	Over head crane	20ton	1	Bando Cranes	BD-15-11-6	September 2016
8	SM-M-008	Painting equipment	-	2	-	-	February 2014
9	SM-M-009	Air compressor	7.5HP	1	Yongjin	UBE75160	February 2014
10	SM-M-010	Air compressor	2.5HP	1	Yongjin	KCA-25	October 2016
11	SM-M-011	Vacuum gauge	0.4kw	1	Shidae Electric Co., Ltd	JWSVP-300	October 2016
12	SM-M-012	Oil pump	1HP, single phase	1	Tae Kwang Hydraulic. Ind. Co	DC Power Pack/Unit	October 2016
13	SM-M-013	SMAW (Arc Welder)	6.5KVA, 80A	1	Hankook Machine Tools Co., Ltd	ASEA-200D	March 2017
14	SM-M-014	Oxygen cutting machine	-	1	-	-	March 2017
15	SM-M-015	High speed cutting machine	1	1	Bosch	NHC-14D	May 2017
16	SM-M-016	Grinding machine	510W	1	Hanil Electricity	TGS-40	October 2016
17	SM-M-017	Polishing machine	270*1050	1	-	-	October 2016
18	SM-M-018	FCAW (CO2 welder)	32KVA, 500A	1	Dwelltech Co., Ltd	COD-500A	November 2016
19	SM-M-019	FCAW (CO2 welder)	29.2KVA, 50~500A	1	Lusem Technology	CAPTAIN-500C	October 2016
20	SM-M-020	FCAW (CO2 welder)	20KVA, 50~500A	1	Worldwell	500LC	February 2014
21	SM-M-021	FCAW (CO2 welder)	15KVA, 50~350A	2	Worldwell	350LC2	October 2017
22	SM-M-022	GTAW (Argon Welder)	18.9KVA	1	Perfect Daidai Co., Ltd	500PT	September 2014
23	SM-M-023	GTAW (Argon Welder)	5.5KVA, 300A	2	Keyang Electric Machinery	KNS-300T	November 2016
24	SM-M-024	Plasma cutting machine	-	1	-	120DP	November 2016
25	SM-M-025	Induction bearing heater	230V	1	Kwangho Co., Ltd. (SKF)	TWIM15	March 2021
26	SM-M-026	Air compressor	10HP	1	Seowon	SP10-250-10	March 2021
27	SM-M-027	Name plate marking machine	150*100mm	1	JSC(Jeongseong) Mastem Marking	MS-150	June 2021

Test/inspection equipment

Inspection equipment list

NO.	Equipment number	Equipment name	Specification	Quantity	Manufacturer	Model name	Acquisition year
1	SM-T-001	Radiation thermometer	-60~550°C	1	HIOKI	FT3700-2	December 2015
2	SM-T-002	Ohmmeter	30000Count	1	GWINSTEK	GOM-802	December 2015
3	SM-T-003	Voltage watt meter	5A~5,000A	1	HIOKI	3169-20	December 2015
4	SM-T-004	Sound level meter	30~130dB	1	TES	1357	January 2016
5	SM-T-005	Vibration meter	0.02~200mm/Seq	1	ACO	3116 (7812B)	January 2016
6	SM-T-006	Film thickness meter	0.001*1.5mm	1	HANDO	HD179-745	January 2016
7	SM-T-007	Insulation resistance meter	5V/100MΩ~ 1000V/4000MΩ	1	HIOKI	IR4052-10	December 2015
8	SM-T-008	Electromagnetic flow meter	0.1~10㎧	1	KOMETER	KTM-800	January 2016
9	SM-T-009	Electromagnetic flow meter	0~200m^3/h	1	KOMETER	KTM-800	April 2017
10	SM-T-010	Gauge pressure gauge (analog)	1KG	1	HAKIN	SS-3074	June 2017
11	SM-T-011	Gauge pressure gauge (analog)	3KG	1	HAKIN	SS3074	June 2017
12	SM-T-012	Gauge pressure gauge (analog)	6KG	1	HAKIN	SS3074	June 2017
13	SM-T-013	Gauge pressure gauge (analog)	10KG	1	HAKIN	SS3074	June 2017
14	SM-T-014	Tachometer	-	1	MONARCH	PLT200	December 2017
15	SM-T-015	Withstand voltage tester	-	1	ILOSAM	ILO-PT2050	January 2018
16	SM-T-016	Micrometer	0~25mm	1	MITUTOYO	M110-25	September 2018
17	SM-T-017	Micrometer	25~50mm	1	MITUTOYO	M110-50	September 2018
18	SM-T-018	Micrometer	50~75mm	1	MITUTOYO	OM-75	September 2018
19	SM-T-019	Micrometer	75~100mm	1	MITUTOYO	OM-100	September 2018
20	SM-T-020	Micrometer	100~125mm	1	MITUTOYO	OM-125	September 2018
26	SM-M-026	Air compressor	10HP	1	Seowon	SP10-250-10	March 2021
27	SM-M-027	Name plate marking machine	150*100mm	1	JSC Mastem Marking	MS-150	June 2021
21	SM-T-021	Micrometer	125~150mm	1	MITUTOYO	OM-150	September 2018
22	SM-T-022	Micrometer	150~175mm	1	MITUTOYO	OM-175	September 2018
23	SM-T-023	Cylinder gauge	18~35mm	1	MITUTOYO	YWL557	September 2018
24	SM-T-024	Cylinder gauge	35~60mm	1	MITUTOYO	YQB934	September 2018
25	SM-T-025	Cylinder gauge	50~150mm	1	MITUTOYO	YMH432	September 2018
26	SM-T-026	Cylinder gauge	100~160mm	1	MITUTOYO	XRF846	September 2018
27	SM-T-027	Cylinder gauge	160~250mm	1	MITUTOYO	YXD535	September 2018
28	SM-T-028	Digital Calipers	300mm	1	MITUTOYO	CD-30	September 2018
29	SM-T-029	Vernier Calipers	600mm	1	MITUTOYO	N60	September 2018
30	SM-T-030	Onnabi Weir	1.5M*0.4H	1	Self manufacturing		August 2016
31	SM-T-031	Onnabi Weir	3M*0.75H	1	Self manufacturing		August 2016
32	SM-T-032	Precision Granite Surface Plate	900*600*130	1	MSP		October 2018
33	SM-T-033	LCR METER	I.462889	1	LUTRON	LCR-9183	October 2018
34	SM-T-034	Electrical force measuring device	200KGF	1	CAS	SBA-200L	October 2018
35	SM-T-035	Straight ruler (metal ruler)		2			
36	SM-T-036	Electronic scale		1			
37	SM-T-037	High voltage motor starting system	500kW	1	Customized manufacturing		January 2016
38	SM-T-038	Low voltage motor starting system	500kW	1	Customized manufacturing		January 2016
39	SM-T-051	Electronic pressure gauge	10Kgf	1	HISCO	P601GH0010	December 2022

Manufacturing equipment

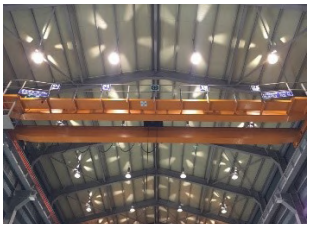
1 Milling

2 Lathe

3 Balancing machine

4 Drilling machine

5 Name plate marking machine



6 Hoist crane

7 Smart factory test-run equipment

8 Compressor

9 Vacuum tester

10 Oil pump

11 Arc welder

12 Oxygen cutting machine

13 High-speed cutting machine

14 Grinding machine

15 Polishing machine

16 CO2 welder

17 Argon welder

18 Plasma welder

19 Induction bearing heater

20 Air compressor

Inspection equipment

1

Radiation thermometer

2

Voltage watt meter

3

Sound level meter

4

Vibration meter

5

Film thickness measuring device

6

Insulation resistance meter

7

Electronic pressure gauge

8

Withstand voltage tester

9

Cylinder gauge

10

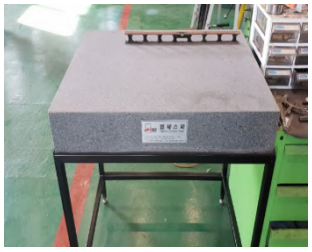
Onnabi Weir

11

Load cell

12

Digital tube inner diameter micrometer

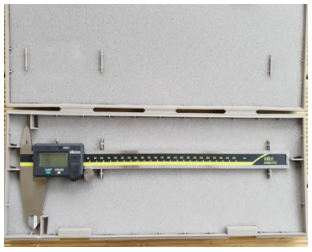


13

Precision Granite Surface Plate

14

Vernier Calipers



15

Digital Calipers

16

Micrometer

Supply records [last 5 years]

No.	Client	Site name (construction name)	Product Name	Product specifications	Date
1	Korea Rural Community Corporation, Cheongwon Branch	Hakso District Drainage Pump Station	Transverse Axial flow pump	ø700*37kw*18P*380V 3units	January 2019
2	Korea Rural Community Corporation, Seocheon Branch	Dangseon Pumping Station	Double suction volute pump	ø400*30kw*12P*380V 1units	February 2019
3	Mokpo-si, Jeollanam-do	Sangdeung drainage station	Submersible Mixed flow pump	ø700*220kw*8P*380V 3units	March 2019
4	Korea Rural Community Corporation, Jangseong Branch	Drainage improvement project of Soohae District	Gate pump	ø500*30kw*10P*380V 1units	April 2019
5	Korea Rural Community Corporation, Haenam, Wando Branch	Drainage Improvement Project of Okdong District	Submersible Axial flow pump	ø500*22kw*10P*380V 2units	April 2019
6	Busan Metropolitan City	Pumping and drainge station of Geunsa District	Gate pump	ø1200*220kw*14P*3300V 3units	June 2019
7	Korea Rural Community Corporation, Hapcheon Branch	Pumping and drainge station of Chogye District	Double suction pump	ø600*340kw*6P*3300V 3units	August 2019
8	Korea Land & Housing Corporation	Hyangdong Apartment Construction Work	Submersible motor pump	100LPM*7M*0.4kw, etc. 105units	November 2019
9	Jeju Special Self-Governing Province	Woljeong Public Sewage Treatment Facility	Cake transfer pump	ø200*110kw*4P*380V 2units	February 2020
10	Namwon-si Environmental Office, Jeollabuk-do	Small village sewage treatment facility maintenance project	Submersible motor pump	ø50*1.5kw*2P*380V 6units	June 2020
11	Namwon-si Environmental Office, Jeollabuk-do	Small village sewage treatment facility improvement project	Reactor blower, etc.	0.67m³/min*4000mm 2units	June 2020
12	Korea Hydro & Nuclear Power (KHNP)	Pumps, etc.	Sump pump	3.7kw*4P*460V 4units	July 2020
13	Seoul Housing and Communities Corporation	Godeok Gangil Apartment	Drainage pump	450LPM*18M*3.7kw, etc. 97units	August 2020
14	Seoul Housing and Communities Corporation	Godeok Gangil 8 Complex Apartment Maintenance Project	Submersible pump, etc.	500LPM*18M*3.7kw*4P 97units	August 2020
15	Korea Environment Corporation, Honam Regional Headquarters	Namwon sewer pipe maintenance project	Submersible motor pump	ø50*1.5kw*4P*380V 10units	September 2020
16	Iksan-si, Jeollabuk-do	Yucheon drainage and pumping station maintenance project	Submersible Axial flow pump	ø1200*320kw*16P*3300V 2units	October 2020
17	Jinan-gun, Jeollabuk-do	Yun-dong, Jinan 2 rural sewerage installation	Submersible motor pump	ø50*0.75kw*2P*380V 3units	November 2020
18	Jeonju-si, Jeollabuk-do	Jeonju Sewage Treatment Plant Reaction Tank	Diffuser	ø64*L1000mm 1,690units	November 2020
19	Jinan-gun, Jeollabuk-do	Sewage pipe maintenance project of Dongyang Geumji District	Submersible sewage pump	ø80*2.2kw*4P*380V 7units	November 2020
20	Korea Rural Community Corporation, Jeonbuk Headquarters	Smart Farm Innovation Valley Infrastructure Development Project	Submersible motor pump	ø100*7.5kw*380V 2units	November 2020
21	Waterworks and Sewerage Office of Wanju-gun	Gui pressurization plant improvement work	Centrifugal pump	140m³/hr*90mH*45kw 2units	November 2020
22	Korea Rural Community Corporation, Hapcheon Branch	Drainage Improvement Project of Imbuk District	Horizontal submersible Axial flow pump	ø900*55kw*14P*380V 3units	December 2020
23	Jeonju-si, Jeollabuk-do	Jeonju Sewage Treatment Plant Maintenance Project	Mixed flow pump	ø600*120kw*8P*380V 2units	December 2020
24	Jeonbuk Regional Procurement Office	Flood damage restoration project of Namwon Branch Gwiseok Drainage Plant	Submersible Mixed flow pump	ø1000*110kw*16P*3300V 4units	March 2021
25	Environmental Office of Namwon-si	Flood damage restoration project of small public sewage treatment facilities	Submersible vortex pump	ø50*0.75kw*2P*380V, etc. 12units	April 2021
26	Sunchang-gun, Jeollabuk-do	Village sewer installation work of Pino District	Submersible pump, etc.	ø50*1.5kw*2P*380V, etc. 11units	April 2021
27	Waterworks and Sewerage Office of Wanju-gun	1st installment of public sewerage facility construction of Wongodang district	Submersible pump, etc.	ø50*1.5kw*2P*380V, etc. 14units	April 2021
28	Korea Rural Community Corporation, Dongjin Branch, Jeollabuk-do	Manufacture and purchase of submersible pump of Daeseok 2 Shingu 2 pumping station	Submersible pump	ø300*22kw*6P*380V, etc. 2units	April 2021
29	Environmental Office of Namwon-si	Old sewer pipe maintenance work of Yongjeon Village	Submersible pump	ø50*1.5kw*2P*380V, etc. 4units	May 2021
30	Korea Rural Community Corporation, Jeonbuk Headquarters	Jeonbuk Smart Farm Innovation Valley Infrastructure Development Project	Large capacity drainage pump	ø250*37kw*6P*380V, etc. 4units	June 2021
31	Korea Rural Community Corporation, Dongjin Branch, Jeollabuk-do	Manufacture and purchase of submersible pump of Gosa Pumping Station	Submersible pump	ø150*11kw*4P*380V, etc. 1units	June 2021
32	Korea Rural Community Corporation, Dangjin Branch, Chungnam	Simple pumping station installation project in Deokma-ri, Jeongmi-myeon	Submersible pump	ø100*15kw*2P*380V, etc. 2units	June 2021
33	Sunchang-gun, Jeollabuk-do	Additional village sewer installation work in Pino district	Submersible pump	ø50*1.5kw*4P*380V, etc. 13units	June 2021
34	Korea Rural Community Corporation, Jeongeup Branch	Maintenance work for the submersible Axial flow pump at Gukjeong Pumping and Drainage Station	Submersible Axial flow pump	ø1500*300kw*24P*380V 1units	June 2021
35	Korea Rural Community Corporation, Dongjin Branch	Manufacture and purchase of submersible pumps of Gudam Drainage Station	Submersible Axial flow pump	ø800*1100kw*10P*380V 2units	June 2021
36	Gumi Infrastructure Corporation	Purchase of new developed submersible sewage pump	Vortex pump	Ø80*3.7kW*2P*380V 1units	June 2021
37	Korea Environment Corporation, Gwangju Jeonnam Jeju Headquarters	Collection Pipeline Maintenance Project of Namwon-si	Spurt	Ø100*7.5kW*4P*380V 3units	July 2021
38	Environmental Office of Namwon-si	Manhole pump of health center of Deokgwa-myun, Namwon-si	Vortex pump	Ø100*7.5kW*2P*380V 2units	July 2021
39	Korea Rural Community Corporation, Gimpo Branch	Purchase of small pumps	Sewage water pump	ø50*0.75kw*2P*380V 1units	August 2021
40	Korea Rural Community Corporation, Sunchang Branch	Purchase of pumps for Sunchang Branch	Sewage water pump	Ø100*15kW*2P*380V 2units	November 2021

No.	Client	Site name (construction name)	Product Name	Product specifications	Date
41	Korea Rural Community Corporation, Dongjin Branch	Pogyo Pumping Station of Nanbong District	Mixed flow pump	Ø1000*200kW*16P*3300V 2units	November 2021
42	Waterworks and Sewerage Office of Wanju-gun	3rd Gujin Phase 2 sewer pipe maintenance project	Vortex pump	ø50*1.5kw*4P*380V 18units	November 2021
43	Gwangju, Jeonnam, Jeju Environmental Headquarters	Namwon Gwangchi Pump Station of Namwon Collection Pipe	Spurt	ø50*1.5kw*4P*380V 2units	November 2021
44	Gwangju, Jeonnam, Jeju Environmental Headquarters	General industrial complex public wastewater treatment facility of Gwangju Energy Valley	Vortex pump, etc.	ø150*22kw*4P*380V, etc. 6units	December 2021
45	Waterworks Office of Namwon-si	Government-supplied materials for Wolak water purification plant improvement project	Sewage water pump	ø50*1.5kw*2P*380V 4units	December 2021
46	Jeongeup-si, Jeollabuk-do	Relocation work of Jeongeup cargo garage pumping station	Vortex pump	ø80*7.5kw*2P*380V 2units	January 2022
47	Korea Rural Community Corporation, Geumgang Project Division	Geumgang (2) District Chunpo 4 Farmland Reorganization Work	Mixed flow pump	ø300*37kw*6P*380V 1units	February 2022
48	Korea Environment Corporation, Busan Ulsan Gyeongnam Environment Headquarters	Changwon drinking & wastewater Bio-energy facility installation project	Progressing cavity pump	1.8m3/min×15mH, etc. 12units	February 2022
49	Gumi Infrastructure Corporation	Purchase of spurt pumps	Spurt	ø50*1.5kw*4P*380V 1units	March 2022
50	Gangseo-gu, Busan	Main Drainage Pump of Deokdu Drainage Pump Station in Daejeo 2 Disaster Risk Improvement District	Mixed flow pump	ø800*190KW*14P*3300V 3units	March 2022
51	Korea Rural Community Corporation, Dangjin Branch	Maebangbal simple pumping station installation civil (mechanical) work materials	Drainage pump	ø100*3.7kw*4P*380V 2units	April 2022
52	Facility Management Corporation of Daejeon-si	Replacement work for old sump pump	Sewage pump	ø80*1.5kw*2P*380V 22units	May 2022
53	Korea Rural Community Corporation Jeonbuk Regional Headquarters, Dongjin Branch	Submersible pump of Daeseok 3 pumping station project of Public institution agency	Drainage pump	ø300*22w*6P*380V, etc. 2units	May 2022
54	Korea Rural Community Corporation, Seosan and Taean Branches	Submersible Pump for Agricultural Water Quality Improvement Project of Jamhong District	Drainage pump	ø300*22w*6P*380V, etc. 2units	June 2022
55	Environmental Office of Namwon-si	3rd Part of Namwon (Phase 3) Sewerage Maintenance Project	Vortex pump, etc.	ø50*1.5w*2P*380V, etc. 7units	July 2022
56	Korea Rural Community Corporation, Jeonnam Regional Headquarters Gangjin Branch	Purchase of unused pumps in preparation for drought and flood damages in military consignment district	Drainage pump	ø80*1.5w*2P*220V, etc. 6units	July 2022
57	Korea Rural Community Corporation, Iksan Branch	Submersible pump replacement work of Singi 1 pumping station	Drainage pump	ø200*11w*4P*380V 1units	August 2022
58	Korea Environment Corporation, Chungcheong Area Environmental Headquarters	Purchase of water collection pumps for automatic water quality measurement net of Geumgang drainage system	Drainage pump	ø40*3.7w*2P*380V 6units	August 2022
59	Environmental Office of Namwon-si	Purchase of government-supplied materials for raw water transfer pump of Unbong sewage treatment plant	Spurt	ø100*2.2w*4P*380V 3units	September 2022
60	Korea Land & Housing Corporation, Seoul Headquarters	Supply of firefighting water pump for Seoul Suseo A3BL Outdoor Firefighting Facility Work	Fire water pump	1.8m^3/min*119mH*100HP, etc. 4units	October 2022
61	Korea Land & Housing Corporation, Seoul Headquarters	Supply of Drainage pumps for Seoul Suseo A1, A3 BL Outdoor Machine and Equipment Work	Drainage pump	ø50*1.5w*2P*380V, etc. 22units	October 2022
62	Iksan-si, Jeollabuk-do	Supply of Air Conditioner for Fencing Academy of Bandabi Disabled Sports Center	Heat pump	40HP*126kW, etc. 7units	October 2022
63	K-Water, Unmun Area Branch	Supply of Drainage Pump for Smart Pipe Net Management of Unmun Dam System Wide Area Water Supply	Sewage pump	ø50*0.75w*2P*220V 17units	October 2022
64	Gochang-gun, Jeollabuk-do	Supply of Machines for Dongchon Rural Sewage Maintenance Project	Spurt	ø80*5.5w*4P*380V 2units	November 2022
65	Jinan-gun, Jeollabuk-do	Supply of Inline Pressurization Pump for Rural Life Water Development Project of Ynagji District	Booster pump	211L/min*65mH*5.5kW*380V, etc. 2units	November 2022
66	Korea Rural Community Corporation	Supply of drainage pump for Jangsan Pumping Station in Cheonan	Mixed flow pump	ø1200*350KW*16P*3300V, etc. 3units	November 2022
67	Jeonju-si, Jeollabuk-do	Purchase of government-supplied material for the 1st Jeonju Sewage Treatment Plant.	Flat (Fine) screen	W1.8m*3.3mH*1.5kW*380V 3units	December 2022
68	Waterworks Office of Namwonb-si, Jeollabuk-do	Mechanical work for the 4th Wolak Water Purification Plant Improvement Project	Sewage pump	ø50*1.5w*2P*380V 4units	December 2022
69	Korea Rural Community Corporation, Namwon Branch	Manufacture and purchase of submersible motor pumps for Namchang simple pumping station	Drainage pump	ø250*11KW*6P*380V 2units	December 2022
70	Korea Rural Community Corporation, Dongjin Branch	Supply of submersible pumps for Hwangsan 2 Pumping Station (Public institution agency project)	Drainage pump	ø200*11KW*4P*380V 1units	December 2022
71	Korea Rural Community Corporation, Sunchang Branch	Manufacture and purchase of submersible pumps for Sisan, Jibuk Simple Pumping Station	Drainage pump	ø100*15KW*4P*380V, etc. 2units	December 2022
72	Korea Rural Community Corporation	Manufacture and purchase of submersible pumps for renovation project of repair facilities of Songyong District	Mixed flow pump	ø800*132KW*20P*380V, etc. 1units	January 2023
73	Korea Rural Community Corporation, Buan Branch	Manufacture and purchase of submersible pumps of Eonbaek District	Drainage pump	ø300*45KW*6P*380V 1units	March 2023
74	Korea Land & Housing Corporation, Gyeonggi Northern Regional Headquarters	Supply of submersible pumps for drainage for Apartment Construction of Namyangju Byeolnae A1-1BL	Drainage pump	ø80*2.2KW*2P*380V, etc. 82units	April 2023
75	Korea Rural Community Corporation	Manufacture and purchase of submersible pumps for Gongju E-in pumping Station	Gate pump	ø350*224KW*4P*3300V, etc. 3units	April 2023
76	Environmental Office of Namwon-si	Sewage Pipeline Maintenance Project of Sannae District	Spurt	ø80*2.2KW*4P*380V, etc. 18units	May 2023
77	Sewage Management Office of Suwon-si	Supply of discharge pumps for Hwanggujicheon Public Sewage Treatment Facility Construction Project	Mixed flow pump	ø800*132KW*8P*380V 2units	July 2023

Supply records

Delivery photos

Delivery of Mixed flow pump to
Ganri pumping station

Delivery of Axial flow pump to Jeongeup
Gukjeong Pumping & Drainage Station

Delivery of Mixed flow pump
and column to Nanbong district

Delivery of column pipes and Mixed flow
pumps to Gangseo-gu, Busan

Delivery of Mixed flow pump to Namwon
Gwiseok Drainage Plant

Delivery of Axial flow pump to
Gimje Gudam Drainage Station

Photos of machine and equipment works

Drainage pump inspection and installation
in Iksan, Jeonbuk

Column installation at relay pump station
in Iksan, Jeollabuk

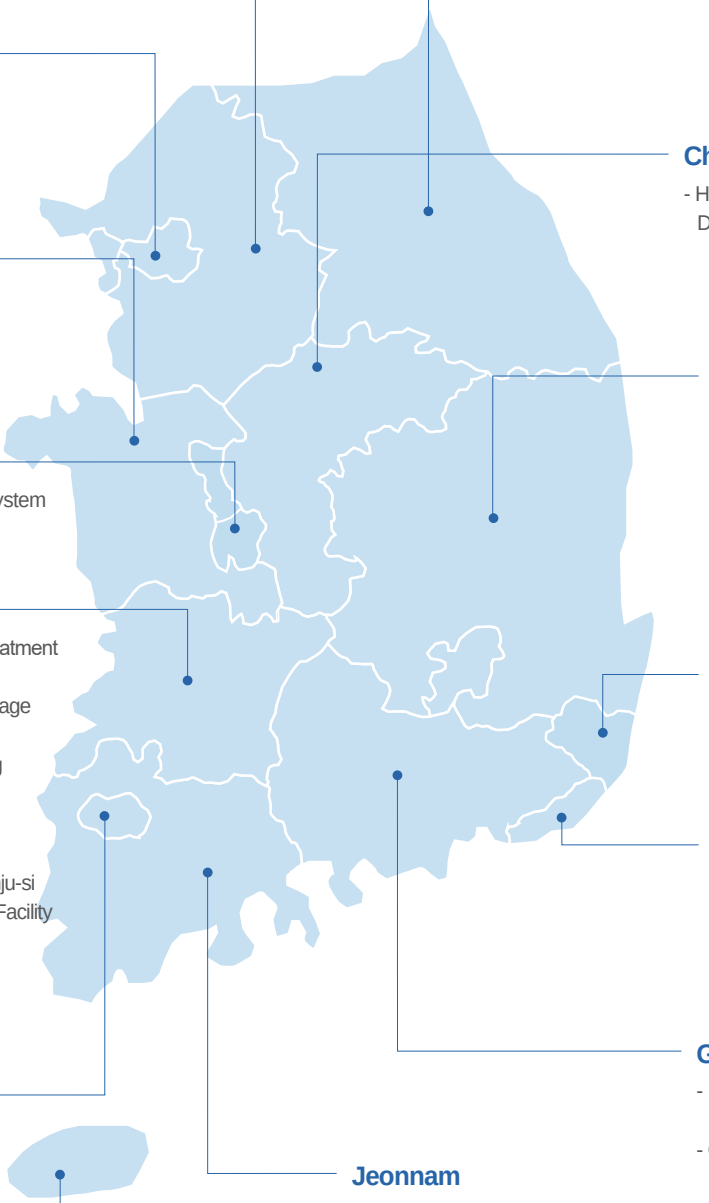
Installation of fine screen at Jeonju
Sewage Treatment Plant in Jeonbuk

Hopper Repair of Jeonju Sewage Treatment Plant
in Jeonbuk

Repair of screener in Eoeun district,
Jeonju-si, Jeonbuk

Production and installation of
Daejeo submersible pump in Busan

Supply records of submersible pumps



Gyeonggi
- Namyangju Byeolnae Apartment
- Paju-si Munsan Gwangtan Court
- Gapyeong Drainage Station
- Goyang Hyangdong Apartment

Seoul
- Amsa 1 water purification plant
- Godeok Gangil Apartment
- Seoul Suseo Apartment

Chungnam
- Simple Pumping Station in Jeongmi-myeon, Deokma-ri

Daejeon
- Daejeon Geumgang Drainage System
- Replacement of old sump pump

Jeonbuk
- Environmental Office Sewage Treatment Plant of Jeonju-si
- Mohyeon District Stormwater Storage Facility of Iksan-si
- Land Readjustment of Geumgang District 2, Gunsan-si
- Seosu Water Pumping Station in Gunsan-si
- Eoeun disaster risk district of Jeonju-si
- Small Village Sewage Treatment Facility of Namwon-si
- Iksan City Bandabi Sports Center
- Improvement work of Gui Pressurization Station

Gwangju
- General industrial complex public wastewater treatment facility of Gwangju Energy Valley

Jeju
- Woljeong Public Sewage Treatment Facility

Jeonnam
- Prepared for drought and flood damages of military consignment district of Gangjin-gun
- Naju-si Hwajang District Drainage Pump Station
- Naju-si Baekryeon Drainage Pump Station

Gangwon-do
- Drainage pumping station of Seongdeok District 2, Gangneung

Chungbuk
- Hakso District, Cheongju Drainage pump station

Gyeongbuk
- Gumi Infrastructure Corporation
- Drainage Pump Station of Heunggak District, Sangju
- Gumi Phase 1 Backwash Pump Building
- Wide area water supply of Unmun Dam System, Cheongdo-gun

Ulsan
- Hyundai Motors drainage pumping station

Busan
- Daejeo 2 Deokdu Drainage Pump Station
- Geumsa District Drainage Pump Station

Gyeongnam
- Pumping and Drainage Plant of Hapcheon-gun Chogye District
- Gimhae Yongjeon 3 Manhole Pump Station
- Goseong-gun Garyeo District Drainage Plant
- Changwon-si Yudeung 3 Pumping and Drainage Plant
- Changwon Drinking water and Wastewater Bioenergy Facility

Names of Parts that obtained direct production certification(33 products)

NO.	Product name	Detailed product name	Detailed product number	Remarks
1	Piping metal parts and equipment	Sluice door	4014178401	
2		Sluice door frame	4014178402	
3	Pumps	Multi-stage volute pump	4015150301	
4		Single-stage volute pump	4015150302	
5		Double suction volute pump	4015150303	
6		Single suction volute pump	4015150304	
7		Metering pump	4015150501	
8		Submersible pump	4015151301	*Excellent procurement joint brand *Pilot purchase of new developed technology product
9		Sewage pump	4015151701	
10		Sludge pump	4015152501	
11		Vertical Axial flow pump	4015154601	
12		Deep well pump	4015154701	
13		progressing cavity pump	4015155301	
14		Booster pump	4015156601	
15		Vertical Mixed flow pump	4015157001	
16		Traverse Mixed flow pump	4015157002	
17	Conveyors and Accessories	Air conveyor	2410171401	
18		Screw conveyor	2410173001	
19		Belt conveyor	2410171201	
20	Lift equipment and accessories	Jib crane	2410165201	
21		Movable beam	2410167601	
22		Sluice winding machine	2410168501	
23		Electric wire rope hoist	2410160201	
24		Over head crane	2410165301	
25	Water treatment and supply equipment	Decanter type centrifugal dehydrator	4710152503	
26		Agitator	4710151201	
27	Water treatment and supply equipment	Impurities disposal machine	4710997801	
28		Drum screen	4710997901	
29		Sewage treatment diffusing device	471099640	
30		Screener	4710998001	
31		Flat screen	4710998701	
32		Hopper	4710998901	
33	Purification device	Deodorizer	4016160501	

Conditions for Negotiable Product Contract

- Special Industrial Complex Certification of Horizon Industrial Complex / Pilot purchase of new developed technology product / NEP and NET
- Patent / Excellent Procurement Joint Brand

Pump Related References

Calculation of discharge diameter according to pumping volume

NO.	Diameter(mm)	Flow rate(m^3/min)
1	50	0.18~0.36
2	65	0.28~0.56
3	80	0.45~0.90
4	100	0.71~1.40
5	150	1.80~3.55
6	200	2.8~6.0
7	250	4.8~9.0
8	300	7.1~14.0
9	350	9.0~18.0
10	400	11.2~22.4
11	450	14.0~28.0
12	500	18.0~35.5
13	600	30~50
14	700	38~70
15	800	54~90
16	900	70~115
17	1000	90~140
18	1200	117~200
19	1350	160~255
20	1500	206~325
21	1600	250~380
22	1800	323~480
23	2000	391~600

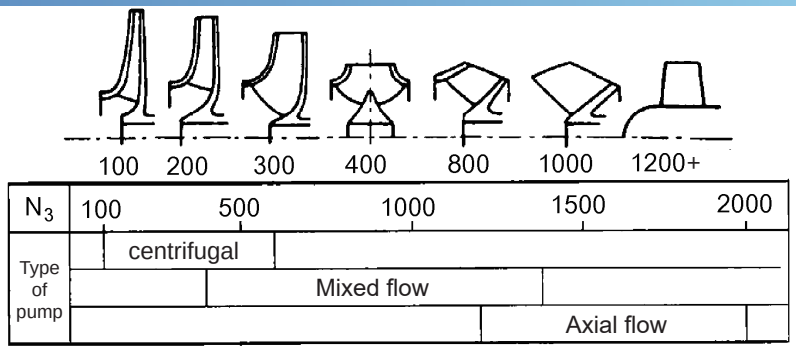
Rotation speed according to number of poles

Number of poles(P)	50Hz	
	synchronous speed	pump speed
2	3000	2350
4	1500	1450
6	1000	950
8	750	720
10	600	580
12	500	485
14	429	410
16	375	365
18	333	325
20	300	290
Number of poles(P)	**60Hz**	
	synchronous speed	pump speed
2	3600	3450
4	1800	1750
6	1200	1165
8	900	875
10	720	700
12	600	585
14	514	500
16	450	435
18	400	390
20	360	350

Starting method of submersible motor pump

Starting method	Capacity
Line Start	15kW ↓
Star Delta Start	18.5kW ↑ 75kW
Reactor Start	90kW ↑
Compensator Start	90kW ↑

Relationship between impeller contours and specific speed



Relationship between impeller contours and their specific speeds

Pump design calculation formula

❶ Review of discharge diameter

$$Dd = 146\sqrt{\frac{Q}{V}}$$

❷ Calculation of brake horsepower(BHP)

$$BHP = \frac{\text{manual power}}{\text{pump efficiency}}$$

❸ Review of pump specific speed

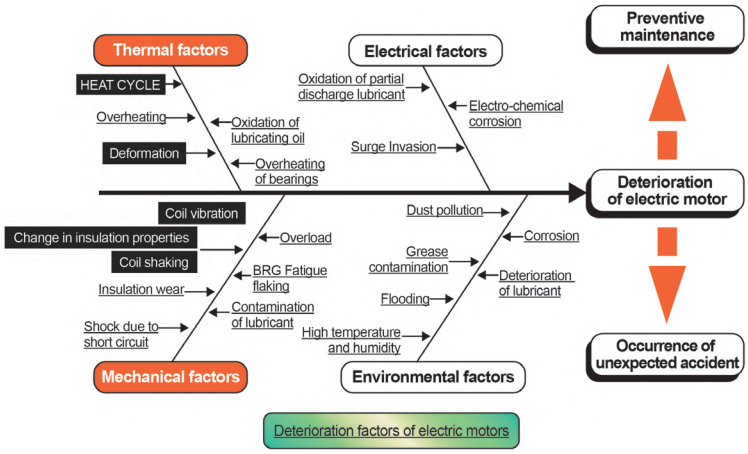
$$Ns = N\frac{\sqrt{Q}}{H^{\frac{3}{4}}}$$

Deterioration factors of electric motors

→ : Mainly caused by deterioration of electric motor insulation

← : Mainly caused by bearing deterioration

<Table 1> Direction and factors of each deterioration factor



Comparison table of insulation reinforcement and rewinding work

No.	Process name	Insulation reinforcement	Rewinding	Remarks
1	**Incoming inspection**			
	1) Visual inspection	●	●	
	2) Electrical inspection	●	●	
	3) Mechanical inspection	●	●	
2	**Disassembly work**			
	1) Disassembly of V-Sheave or Coupling	●	●	
	2) Disassembly of Bearing Bracket	●	●	
	3) Disassembly of stator and rotor	●	●	
	4) Disassembly of Bearing	●	●	
3	**Stator work**			
	1) Removal of foreign substances	●		
	2) Stator cleaning	●		
	3) Drying	●	●	Drying time is almost same
	4) Vacuum impregnation	●	●	Rewinding process requires a lot of varnish.
	5) Drying	●	●	
	6) Insulation coating	●	●	
	7) Disassembly of winding and core cleaning		●	
	8) Winding and forming		●	Material input (movement route)
	9) Insulation/sol;dering/wiring		●	Material input (insulation)

No.	Process name	Insulation reinforcement	Rewinding	Remarks
4	Rotor work			
	1) Visual inspection	●	●	
	2) Washing and drying work	●	●	
	3) Runout and dimension check	●	●	
	4) Balancing	●	●	
	5) Insulation coating	●	●	
5	**Bearing peripheral parts**			
	1) Soundness evaluation (visual inspection and measurements)	●	●	
	2) Cleaning and painting	●	●	
6	**Bearing replacement work**	●	●	
7	**Assembly and Testing**			
	1) Measurement of distance between bearings	●	●	
	2) Air Gap Measurement	●	●	
	3) Hand Turn Check	●	●	
	4) General test (measurement of characteristics and vibration)	●	●	
	5) Painting	●	●	
8	**Shipment**			
	1) Shipping inspection	●	●	
	2) Transportation	●	●	

※ Insulation reinforcement work

After 10 years of operation, the main parts of the electric motor deteriorate due to electromagnetic force during operation, and insulation breakdown failure occurs due to coil movement caused by electromagnetic force. Therefore, motors with 6 to 7 years old need to be disassembled to evaluate the soundness of the main parts by insulation reinforcement in order to extend the life of the motor and save maintenance costs.

※ Winding replacement work

This is the work to be done on motors that operate for a long time or have frequent starting frequencies without insulation reinforcement work as described above. In other words, when environmental conditions are poor and a breakdown occurs due to insulation breakdown caused by insulation deterioration or a malfunction of the motor, rotor, or bearing, and the failure progresses to a secondary failure, winding replacement work is performed.

Handling Instructions of SM Industry's submersible pump

1. Matters to check when the product is delivered.

1. Check whether the nameplate contents of the submersible pump conforms the order.
2. Check whether the cable is nicked or damaged during transportation.
3. Check and compare with the packing list to see if any accessories or spare parts are missing.

2. Precautions before operation

1. Handle the pump carefully to avoid impact and never pull the cabtyre cable.
2. Be careful not to submerge one end of the cabtyre cable in water.
3. When using the pump after storing for a long period of time, measure the ground resistance with a 500V insulation resistance meter and check that it is 20MΩ.

3. Precautions during installation

1. The pump must be installed on a flat and solid place.
2. The connection wires must have the specified capacity and few connected portions as possible. If it is inevitable to connect and use it, make sure to completely waterproof it.
3. In the case of automatic operation, select the pump considering the size of the pump tank and ensure that the pump does not start and stop repeatedly in a short period of time.

4. Checklist during test run

1. Before test run, clean the inside of the pump tank to prevent clogging of the pump by foreign substances.
2. Double-check that the power supply matches the pump specifications.
3. Check that the capacity of the panel circuit breaker is adequate.
4. Check the rotation direction of the pump. The pump should rotate clockwise when viewed from above. If the pump operates in reverse, care must be taken to avoid operating in reverse, as the head will be less than the specified head, the flow rate will drop significantly, and the life of the pump will be greatly shortened.
   In case of reverse operation, switch two motor lead wires each other and connect them.
5. If the current value exceeds the rated current value during pump operation, stop operation immediately and check the following.
   a. Is the concentration of the pumping liquid too thick?
   b. Is excessive foreign substance entering the pumping liquid?
   c. Is the valve open too much?
   d. Is there any voltage drops?
   e. Is the incoming cable capacity insufficient compared to the specified value?
   f. Is the panel instrument operating normally?
   g. Is there any excessive vibration or noise?
6. When testing the pump that has been stored for a long time, some rotating parts of the pump (impeller, etc.) may be stuck, so check by operating the start switch 2 to 3 times.

5. Matters to check during operation

1. Check that solids large enough to impede the impeller are flowing in.
2. Check if there are any problems with the piping (check the connection area of the automatic detachment unit).
3. Check if the flow rate drops significantly.
4. Check that the power supply is at the specified voltage.
5. Check if the current value is below the rated current value.
6. When measuring insulation resistance, make sure it is 20MΩ or more.
7. Check that the panel circuit breaker operates normally.

Handling Instructions of SM Industry's submersible pump

First aid tips

Type	Problems	Causes	Troubleshooting
Supply	Pressed the operation switch, but there is no change in current and the operation lamp does not light.	1. Input power is not being supplied. 2. The circuit breaker in the panel is OFF. 3. The fuse is blown. 4. Parts inside the panel are broken or the circuit connection is bad. 5. The connection status of the operation switch is defective or broken.	1. Check whether input power is supplied and request power supply if necessary. 2. Check the circuit breaker status and correct it to ON. 3. Replace the fuse with a fuse with rated capacity. 4. Turn the wiring breaker On and check with a tester along the power supply path and take action if necessary. 5. Check the condition of the operation switch and repair or replace it if necessary.
	The pump does not operate continuously and the circuit breaker trips.	1. The capacity of the circuit breaker is insufficient. 2. The wiring on the output side is not correct. 3. The voltage drop is severe during operation. 4. A problem occurred in the valve and piping. 5. The motor is damaged. 6. The pump is stopped.	1. Check the breaker capacity and replace it with the rated capacity if necessary. 2. Check and correct the wiring condition. 3. Check the distance between the transformer and the panel, and the distance between the pump station and the panel to see if the wire capacity is appropriate, and replace the wire if necessary. 4. During test operation, check the valve opening/closing status for each type and check if the pipes are clogged. 5. Completely separate the power cable of the output side from the terminal block and measure the insulation resistance between ground and phase. 6. Lift the product and remove the cause of the interruption.
	The pump operates, but overcurrent flows.	1. The voltage drop is severe. 2. The conditions of the pumping liquid are not met. (stopped by foreign substances and specific gravity of the pumping liquid increased) 3. The pumping head is not correct. 4. The motor rotation direction is in reverse	1. Check the voltage during operation and replace the cable with the one having sufficient capacity. 2. Check the condition of the pumping liquid to take action and remove trapped foreign substances. 3. Adjust the valve opening and closing to keep it within the rated current. 4. Change the wiring to make the pump rotate correctly.
Aerator		1. There is a problem with the piping system. 2. The valve is blocked. 3. The water is deep.	1. If the connection portion of the pipe or hose is torn allowing water to flow in, or the connection part is blocked by the packing, remove the packing. 2. Open the valve completely. 3. Install a stand at the bottom of the product to adjust the water depth.
Common	Operation and stopping are repeated frequently.	1. The direction of rotation is in reverse 2. The intake port is blocked by foreign matter. 3. There is a water leak. 4. The pipe is clogged. 5. The impeller has been worn.	1. Operate in correct rotation. 2. Remove foreign substances. 3. Check the piping system and take action if necessary. 4. Remove blockages. 5. Replace the impeller.
		1. The detection distance between the low and high water level of the level switch is too close. 2. The product capacity is too large compared to the well or PIT capacity. 3. The contact point of the magnetic switch is poor, so connection and short circuit are repeated. 4. The motor protection unit operates because the motor part is exposed causing overheating inside the motor.	1. Adjust the installation distance of the water level sensors. 2. Close the discharge valve to adjust the amount of pumping water or replace the product. 3. Clean or replace the magnetic switch. 4. Make sure the product is completely submerged in water.

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