

IntelliFlex® ADVANCED VERTICAL PUMPING UNIT





IntelliFlex[®]

BEST BUILT BRAND
VERTICAL PUMPING UNIT

In the past 20 years Lift Innovation Universal (LIU) has made unrelenting efforts toward integrating the most advanced technology and the most reliable design into a superior product. In mainland China, North America, South America, the Middle East, Russia, and other regions we will assist our customers in the development of safe and reliable utilization of IntelliFlex vertical pumping units.

By being a global leader in technology LIU has grown from a Chinese oil pumping equipment manufacturer into a multinational company providing excellent solutions to its customers worldwide. IntelliFlex vertical pumping units have been recognized throughout the industry for the development of shale horizontal wells, thermal recovery of heavy oil, and drainage of natural gas wells by winning the favor of global oil and gas customers.



Power Transmission System Motor Deceleration Roller 02 | Braking System Electromagnetic Brake Brake Holder **Suspension System** Beam Hanger Load Belt Belt Hanger Connector INTERNET + TECHNOLOGY As a "Internet+ Petro-equipment" industry leader LIU integrates cloud computing, Big Data, Internet of Things (IoT), and Mobile Internet to achieve "Internet+ Petro-equipment". LIU innovates by combining "Petrol-Control-Integration" and "Monitoring-Maintenance-Analysis (MMA) 3-in-1 Data Link" for cost saving. LIU provides a low cost, highly reliable, and super intelligent

digital control platform on the cloud-based system. Also, LIU can

provide system upgrades to meet customers' requirements.

OPERATION AND PERFORMANCE

Via the Alternating Current Variable Frequency Drive (AC VFD) control technology, the controlled motor drives a deceleration roller back and forth to complete the reciprocating motion of the load belt. Movement of the output roller through forward and reverse rotation provides back and forth movement of the load belt which in turn drives up and down movement of the counterweight box and the downhole load. Variable control of the motor and the deceleration roller mechanism provides unrivaled digital control of stroke and stroke frequency of the IntelliFlex.

As a type of long stroke pumping unit with derrick frame, the IntelliFlex is developed with a series of advanced technology such as motor vector control technology, torque control technology, and intelligent control theory. With a simplified mechanical structure and premier operating methodology the IntelliFlex can effortlessly adjust the stroke frequency and stroke length providing maximum reliability with minimum maintenance costs. When well service is necessary, four abdicating lifting wheels in the base can conveniently enable the product to back away from the wellhead to provide access. After service the wellhead alignment can be completed by returning the IntelliFlex to the previous location. Such ease of mobility ensures cost savings by reducing labor costs and increasing operating hours.

The control system of the IntelliFlex allows real-time management of wellhead operation by utilizing programmable logic controller (PLC) technology and remote terminal unit (RTU) technology to provide continuous monitoring and adjustment for parameters such as stroke length, effective pumping length, and stroke frequency resulting in optimum liquid pumping production.

With a series of advanced technology combined with precision manufacturing the IntelliFlex ensures unrivaled reliability and efficiency while providing simplicity of operation and maintenance.

△ | Control System

AC VFD Control Cabinet Proximity Switch Sensors

05 | Balance System

Counterweight Box Anti-fall Device

6 | Frame and Base System

Upper Platform
Derrick Frame
Base
Diagonal Bars
Ladders
Abdicating Lifting Wheels

Straightforward Structure

A loading belt and a roller are the sole transmission components. Creatively, elastic deformation of the loading belt and the friction between belt and roller vastly reduces the effect of reversing the direction of rotation resulting in extended service life of the belt to greater than ten years.

Fast, Easy, and Safe

LIU always put safety as our #1 priority. The top roller, the build-in counter weight, and power loss brake/protection ensures Intelliflex is the most reliable and safe pumping unit. A built-in safety system continuously monitors any overload, load-loss, phase failure, or power-off. Operational parameters can be modified either via an interactive panel inside the control cabinet or remotely via the internet.

Adaptive, Flexible and Low-Maintenance

A wide working range of 0 - 150 Hz can be provided to the AC VFD to allow the Flex Lift to operate in a range of environments such as in conventional wells, heavy oil wells, low permeability wells, prolific wells, ultra-deep wells, highly deviated and densely packed wells, and on offshore platforms. The roller motor oil only requires two changes each year making maintenance extremely simple. Modular components reduce labor-cost and enhanced operational hours.

High Mechanical Efficiency and Energy Efficient

With specially designed AC VFD control technology, the operating motor can dynamically output power to match the load requirements providing continuous energy savings. The short drive chain and adjustable symmetrical balance further contributes to energy savings. A minimum mechanical efficiency of 85% and minimum system efficiency of 35% is the result.

Internet Accessible

With the integrated PLC and RTU, the IntelliFlex can be controlled remotely via the internet allowing for operational parameters to be detected, analyzed, and modified.

Long Stroke Length and Low Frequency of Pumping

As the most significant feature of IntelliFlex, the efficiency is maximized resulting in greatly extending the lifespan of the downhole tool. With a modular design the custom-made frame is entrusted worldwide to ensure exact scale of stroke for wells. During operation the variable frequency drive (VFD) control system can adjust stroke length, stroke number, and operating speed.

PRODUCT ADVANTAGE

Specifications

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Model	Maximum polished rod	Stroke length	Maximum strokes per minute (SPM)	Minimum strokes per minute (SPM)	Shipping weight	IntelliFlex ® dimension at installation (L x W x H)
IntelliFlex ® 5	11, 200 lb (5, 000 kg)	197 in. (5 m)	5.7	0.1	7, 700 lb (3, 500 kg)	11.2 ft x 5.3 ft x 25 ft (3.4 m x 1.6 m x 7.7 m)
IntelliFlex ® 8	18, 000 lb (8, 000 kg)	197 in. (5 m)	5.7	0.1	12, 300 lb (5, 600 kg)	11.2 ft x 5.9 ft x 27 ft (3.4 m x 1.8 m x 8.2 m)
IntelliFlex ®10	22, 500 lb (10, 000 kg)	236 in. (6 m)	5.2	0.1	15, 400 lb (7, 000 kg)	14.8 ft x 6.9 ft x 32 ft (4.5 m x 2.1 m x 9.6 m)
IntelliFlex ® 12	27, 000 lb (12, 000 kg)	236 in. (6 m)	5.2	0.1	18, 500 lb (8, 400 kg)	14.8 ft x 6.9 ft x 32 ft (4.5 m x 2.1 m x 9.6 m)
IntelliFlex ®14	31, 500 lb (14, 000 kg)	236 in. (6 m)	5.2	0.1	21, 600 lb (9, 800 kg)	114.8 ft x 6.9 ft x 32 ft (4.5 m x 2.1 m x 9.6 m)
IntelliFlex ®16	36, 000 lb (16, 000 kg)	315 in. (8 m)	4.5	0.1	24, 700 lb (11, 200 kg)	14.8 ft x 7.4 ft x 39 ft (4.5 m x 2.3 m x 12 m)
IntelliFlex ® 18	40, 500 lb (18, 000 kg)	315 in. (8 m)	4.5	0.1	27, 800 lb (12, 600 kg)	14.8 ft x 7.4 ft x 39 ft (4.5 m x 2.3 m x 12 m)
IntelliFlex ® 20	45, 000 lb (20, 000 kg)	315 in. (8 m)	4.2	0.1	30, 800 lb (14, 000 kg)	16.4 ft x 7.4 ft x 44 ft (5 m x 2.3 m x 13.5 m)
IntelliFlex ® 22	49, 500 lb (22, 000 kg)	315 in. (8 m)	4.2	0.1	34, 000 lb (15, 400 kg)	16.4 ft x 7.4 ft x 44 ft (5 m x 2.3 m x 13.5 m)
IntelliFlex ® 24	54, 000 lb (24, 000 kg)	394 in. (10 m)	4.0	0.1	37, 000 lb (16, 800 kg)	16.4 ft x 7.4 ft x 44 ft (5 m x 2.3 m x 13.5 m)
IntelliFlex ® 26	58, 500 lb (26, 000 kg)	394 in. (10 m)	4.0	0.1	40, 100 lb (18, 200 kg)	16.4 ft x 7.4 ft x 44 ft (5 m x 2.3 m x 13.5 m)
IntelliFlex ® 28	63, 000 lb (28, 000 kg)	394 in. (10 m)	4.0	0.1	43, 200 lb (19, 600 kg)	16.4 ft x 7.4 ft x 48 ft (5 m x 2.3 m x 14.5 m)
IntelliFlex ® 30	67, 500 lb (30, 000 kg)	394 in. (10 m)	4.0	0.1	46, 300 lb (21, 000 kg)	16.4 ft x 7.4 ft x 48 ft (5 m x 2.3 m x 14.5 m)



GRAVITY BALANCE



UP/DONW SPM ADJUSTABLE SEPERATELY



AC 380V ~ 480V 50Hz ~ 60Hz







Maximum Production by Vertical Depth

IntelliFlex® 1	6 10	12 14	16 18	20 22 24	26 28 30
Vertical Depth	Pump Size	SPM	Stroke Length	Structural %	Maximum Production
2,000 ft (609 m)	5.75 in (14.6cm)	4.50	315 in. (8 m)	98.5	5,213 bbl/d (828.8 m³/d)
3,000 ft (914 m)	4.75 in (12.1cm)	4.50	315 in. (8 m)	99.9	3,377 bbl/d (537.0 m³/d)
4,000 ft (1,219 m)	3.75 in (9.5cm)	4.50	315 in. (8 m)	99.9	2,154 bbl/d (342.5 m³/d)
5,000 ft (1,524 m)	3.25 in (8.3cm)	4.50	315 in. (8 m)	100.0	1,567 bbl/d (249.1 m³/d)
6,000 ft (1,828 m)	2.75 in (7.0cm)	4.50	315 in. (8 m)	100.0	1,139 bbl/d (181.2 m³/d)
7,000 ft (2,133 m)	2.50 in (6.4cm)	4.50	315 in. (8 m)	99.5	909 bbl/d (144.6 m³/d)
8,000 ft (2,438 m)	2.25 in (5.7cm)	4.50	315 in. (8 m)	100.0	712 bbl/d (113.2 m³/d)
9,000 ft (2,743 m)	1.75 in (4.4cm)	4.50	315 in. (8 m)	100.0	485 bbl/d (77.2 m³/d)
10,000 ft (3,048 m)	1.50 in (3.8cm)	4.50	315 in. (8 m)	100.0	360 bbl/d (57.3 m³/d)
11,000 ft (3,352 m)	1.25 in (3.2cm)	4.50	315 in. (8 m)	99.7	263 bbl/d (41.8 m³/d)
12,000 ft (3,657 m)	1.25 in (3.2cm)	4.50	315 in. (8 m)	91.9	247 bbl/d (39.4 m³/d)

ItelliFlex® 18	10	12 14	¹⁶ 18	20 22 24	26 28 30
Vertical Depth	Pump Size	SPM	Stroke Length	Structural %	Maximum Production
2,000 ft (609 m)	5.75 in (14.6cm)	4.50	315 in. (8 m)	99.5	5,341 bbl/d (849.2 m³/d)
3,000 ft (914 m)	4.75 in (12.1cm)	4.50	315 in. (8 m)	99.6	3,574 bbl/d (568.3 m³/d)
4,000 ft (1,219 m)	4.25 in (10.8cm)	4.50	315 in. (8 m)	100.0	2,853 bbl/d (453.5 m³/d)
5,000 ft (1,524 m)	3.75 in (9.5cm)	4.50	315 in. (8 m)	100.0	2,082 bbl/d (331.1 m³/d)
6,000 ft (1,828 m)	2.75 in (7.0cm)	4.50	315 in. (8 m)	100.0	1,576 bbl/d (250.6 m³/d)
7,000 ft (2,133 m)	3.25 in (8.3cm)	4.50	315 in. (8 m)	99.7	1,154 bbl/d (183.5 m³/d)
8,000 ft (2,438 m)	2.75 in (7.0cm)	4.50	315 in. (8 m)	99.0	961 bbl/d (152.8 m³/d)
9,000 ft (2,743 m)	2.50 in (6.4cm)	4.50	315 in. (8 m)	98.2	750 bbl/d (119.3 m³/d)
10,000 ft (3,048 m)	2.00 in (5.1cm)	4.50	315 in. (8 m)	96.9	610 bbl/d (97.1 m³/d)
11,000 ft (3,352 m)	1.75 in (4.4cm)	4.50	315 in. (8 m)	94.7	479 bbl/d (76.2 m³/d)
12,000 ft (3,657 m)	1.50 in (3.8cm)	4.50	315 in. (8 m)	91.2	368 bbl/d (58.5 m³/d)

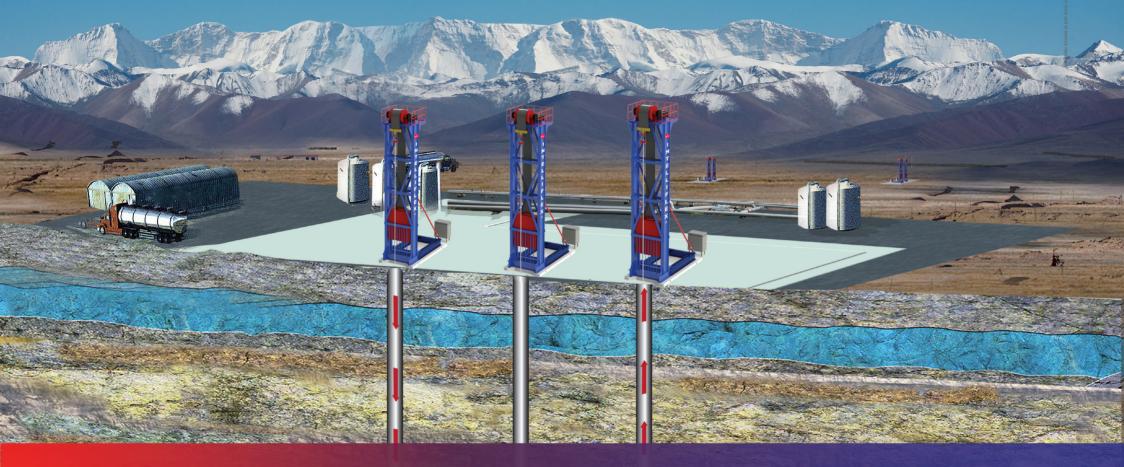
Tables indicate theoretical (not actual) results.

IntelliFlex® 20			16 18 2	20 22 24	26 28 30
Vertical Depth	Pump Size	SPM	Stroke Length	Structural %	Maximum Production
2,000 ft (609 m)	5.75 in (14.6cm)	4.20	355 in. (9 m)	98.5	5,635 bbl/d (895.9 m³/d)
3,000 ft (914 m)	4.75 in (12.1cm)	4.20	355 in. (9 m)	99.9	3,799 bbl/d (604.0 m³/d)
4,000 ft (1,219 m)	4.25 in (10.8cm)	4.20	355 in. (9 m)	99.9	2,959 bbl/d (470.5 m³/d)
5,000 ft (1,524 m)	3.75 in (9.5cm)	4.20	355 in. (9 m)	99.2	2,277 bbl/d (362.1 m³/d)
6,000 ft (1,828 m)	3.25 in (8.3cm)	4.20	355 in. (9 m)	100.0	1,703 bbl/d (270.7 m³/d)
7,000 ft (2,133 m)	2.75 in (7.0cm)	4.20	355 in. (9 m)	99.9	1,245 bbl/d (197.9 m³/d)
8,000 ft (2,438 m)	2.50 in (6.4cm)	4.20	355 in. (9 m)	99.0	1,002 bbl/d (159.3 m³/d)
9,000 ft (2,743 m)	2.50 in (6.4cm)	4.20	355 in. (9 m)	97.0	816 bbl/d (129.8 m³/d)
10,000 ft (3,048 m)	1.50 in (3.8cm)	4.20	355 in. (9 m)	96.0	778 bbl/d (123.7 m³/d)
11,000 ft (3,352 m)	2.00 in (5.1cm)	4.20	355 in. (9 m)	94.7	629 bbl/d (100.0 m³/d)
12,000 ft (3,657 m)	1.75 in (4.4cm)	4.20	355 in. (9 m)	92.9	484 bbl/d (77.1 m³/d)

IntelliFlex® 22	2 10			22 24	
Vertical Depth	Pump Size	SPM	Stroke Length	Structural %	Maximum Production
2,000 ft (609 m)	5.75 in (14.6cm)	4.20	355 in. (9 m)	100.0	5,712 bbl/d (908.1 m³/d)
3,000 ft (914 m)	5.25 in (13.3cm)	4.20	355 in. (9 m)	99.9	4,445 bbl/d (706.6 m³/d)
4,000 ft (1,219 m)	4.50 in (11.4cm)	4.20	355 in. (9 m)	99.9	3,235 bbl/d (514.4 m³/d)
5,000 ft (1,524 m)	4.00 in (10.2cm)	4.20	355 in. (9 m)	100.0	2,522 bbl/d (401.0 m³/d)
6,000 ft (1,828 m)	3.50 in (8.9cm)	4.20	355 in. (9 m)	100.0	1,887 bbl/d (300.1 m³/d)
7,000 ft (2,133 m)	3.00 in (7.6cm)	4.20	355 in. (9 m)	99.5	1,412 bbl/d (224.4 m³/d)
8,000 ft (2,438 m)	2.75 in (7.0cm)	4.20	355 in. (9 m)	98.0	1,153 bbl/d (183.3 m³/d)
9,000 ft (2,743 m)	2.50 in (6.4cm)	4.20	355 in. (9 m)	97.3	950 bbl/d (151.0 m³/d)
10,000 ft (3,048 m)	2.25 in (5.7cm)	4.20	355 in. (9 m)	96.2	790 bbl/d (125.6 m³/d)
11,000 ft (3,352 m)	2.00 in (5.1cm)	4.20	355 in. (9 m)	93.2	637 bbl/d (101.3 m³/d)
12,000 ft (3,657 m)	1.75 in (4.4cm)	4.20	355 in. (9 m)	90.1	491 bbl/d (78.1 m³/d)

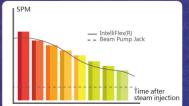






HEAVY OIL PRODUCTION AND THERMAL RECOVERY

In order to pump high viscosity oil-water fluid, in a heavy oil well, IntelliFlex can utilize a different pumping rate for upstroke and downstroke based on different situations. A slow down-stroke and fast up-stroke strategy can be applied to heavy oil production. IntelliFlex can modulate stroke and frequency according to changing viscosity and liquid level. For example, higher frequency could be used when a heavy oil well applies steam injection so as the viscosity gradually increases the frequency gradually







EFFICIENT DESIGN
AND ENERGY SAVINGS











The remarkable characteristic of AC VFD is that the motor can vary power output according to load size and running speed. Thereby providing much great energy efficiency in contrast to beam pumping units. For all pumping units the energy consumption of this control technology is the lowest.

The short mechanical transmission chain and the symmetrical balance provide ideal balance and ease of adjustment so the mechanical efficiency can reach more than 85% and the system efficiency can reach more than 35%. Compared with beam pumping units the energy savings is consistently greater than 70% and compared with ESP the energy savings is consistently greater than 25%.





OPERATIONAL IN AN ARRAY OF ENVIRONMENTS

IntelliFlex lifts are widely used in the Gobi Desert of northwestern China. The winter is extremely cold (i.e., below -40°F) and the summer is extremely hot (i.e., above 113°F) with strong winds more than one-third of the year often accompanied by sandstorms and thunderstorms.

The open frame used for IntelliFlex lifts can greatly reduce the wind resistance while the high strength steel structure on both sides has better stability than the other tower pumping units thereby withstanding winds of 58 knots without interruption to operation. Additionally, the design of IntelliFlex lifts prevents the problem of sand and dust accumulation thereby providing high reliability and stability.



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RESISTANT TO ALPINE DESIGN
TO ENSURE THE STABLE OPERATION OF HIGH LATITUDES

IntelliFlex units incorporate a number of original all-weather designs which can ensure continuous efficient and safe operation of the whole system under extreme cold, extreme heat, strong wind, and large temperature daily temperature variations.

The first batch of IntelliFlex units were put into service in 2006 in Xinjiang, China, which has temperatures below 39 C in the winter and temperatures above 48 C in the summer. The temperature difference between day and night in spring and autumn reaches 30 C. Strong winds are prevalent one-third of the day throughout the year and are often accompanied by sandstorms. These units have been in continuous operation for 11 years with each unit has exceeded more than 50,000 operational hours.

Currently there are more than 1,000 IntelliFlex units in operation in the area.









Selection and Technical Support

IntelliFlex units include free technical support for 90 days after purchase in order to ensure that each IntelliFlex unit is the best product to meet the actual needs of users.



Operation Training

Free training course for users of IntelliFlex units. The main course includes process shutdown, adjustment of parameters, increasing and decreasing counter weights, troubleshooting, assembly and disassembly, and standard safety procedures.



Maintenance

We provide professional and low-cost maintenance programs for users in the vicinity of the deployment of all IntelliFlex units. We have a spare parts warehouse, equipped with skilled maintenance personnel, to provide users with 24/7 service. In addition, in line with the tenet of customer-oriented service, we provide the customer service team with necessary technical materials and professional training,

INSTALLATION
AND MAINTENANCE





Case A Well



The acreage is CO2/water injection oilfield, the water cut is as high as 98%, CO2 saturation is 88%. For this specific well, its targeted production was 730 bbls fluid and 350 mcf gas. The expected pump efficiency was 50%. The expected flowing period was 1-2 months. The total production will be increased afterward as the pump efficiency increases. The maximum production of IntelliFlex® 22 with 4'-1/4 tubing pump is around 2050 bbls. It fulfilled the need and the spm/stroke length can be adjusted accordingly via cloud-based online system. This remote control/monitoring platform also massively saved the cost of pumping unit adjustment and other maintenance works and greatly reduced downtime of the well

For this specific well, IntelliFlex® also showed its advantages of long stoke length and low spm. It relatively increased pump efficien cy in high gas-fluid ratio scenario, comparing with beam pumping unit and jet pump (30% pump efficiency on average). It also reduces the chance of gas-lock, which also made the rods and pump more durable, effectively increased the stability and reliability of facilities and production.



Case B Well

The relative density of crude oil in this well is 0.9496D204(20°C); The viscosity at 30°C is 29740m2/s, at 40°C is 10039m2/s, at 50°C is 3852m2/s. The freezing point is 22°C; Wax content is 2.29%; The gum content is 3.98%; Salt content is 10241mg/l; Sediment concentration 0.09%; Sulfur content of 0.13%; The initial distillation point is 23°C. Initial production of daily liquid production 35t, daily oil production 15t, the cumulative production of 1330 days, accumulative oil producing 12761.56t, the average water cut is 62°33%.

As an electromechanical integrated pumping unit, the Intelliflex unit has the characteristics of high efficiency, energy saving, no polarization adjustment in the rated range, and more, the speed of polished rod upward or downward can be regulated separately. Intelliflex has intelligent processing mode with perfect protection function, making it a safe and reliable machine, simple operation, easily adjust parameter, high efficiency in motor power factor and system. It also just need simple and convenient maintenance, without any disadvantages of beam pumping unit, such as difficulty of adjusting reference, high energy consumption. Accordingly, the labor work is required very little, which improve the production efficiency of oil wells and low the relative cost.

The total maintenance cost of the oil well is only 1/5, compared with one with a beam pumping unit. The electrical part adopts the advanced frequency converter to optimize the operation of the motor, which reduces the electromagnetic loss. So its power factor is more than 85%, which reduces the reactive loss and improves the efficiency of the whole system.



Case C Well

The relative density of crude oil in this well is 0.9584D204(20°C); The viscosity at 30°C is 19000m2/s, at 40°C is 7409m2/s, at 50°C is 2805m2/s. The freezing point is 16°C; Wax content is 1.28%; The gum content is 5.99%; Salt content is 2461mg/l; Sediment concentration 0.13%; Sulfur content of 0.06%; Bituminous content is 0.53%; he initial distillation point is 132°C. The cumulative production of 348 days, accumulative oil producing 2577.19t, the average water cut is 29.61%.

Stroke Per Minute (SPM) of the units is directly related to the energy consumption. It is more complicated to adjust the SPM of the beam pumping unit, which usually need replace the belt or a speed regulating motor, which means labor intensive and the SPM can not match accurately the change of downhole fluid volume thus resulting in the large times of strokes with low yield (The unit volume of liquid consumes a lot of electricity). On opposite, IntelliFlex is easy to adjust and can be adjusted in a few seconds without down time. The SPM can be adjusted according to the amount of liquid in a timely manner, which significantly reduces the energy consumption.

It has been over one year since IntelliFlex was installed in this oil well. Based on the records on our remote monitoring platform, we have adjusted parameters 49 times according to different needs, safely, smoothly, satisfactory and accurate.