

## CONOVA Technical Solutions

BEIJING CONOVA TECH. CO., LTD ( hereinafter referred to as "CONOVA") was established in 2016 and is located in Jingang Building,Wangjing S&T Park,Chaoyang District,Beijing.CONOVA is a national high-tech enterprise with FloWise® intelligent water control technology as its core competitiveness, focusing on enhancing oil and gas recovery for oil and gas field customers by water control and oil increase .

CONOVA cooperated with universities to conduct industry-academia research. We have conducted simulation tests on the core control components regarding hydrodynamics and aerodynamics, built test systems, and conducted performance tests. We have developed various types of intelligent water control products for oil and water two-phase, oil, gas, and water three-phase, high gas cut wells, high water cut wells, and suitable for fracturing wells.

We Have successively applied for the " Adaptive Flow Control Device for Gas Wells" , " Adaptive Flow Control Device for Oil Recovery with Active Adjustment " , "Switchable Flow Control Device and its Water Control Completion Tubular Column", "Oil Recovery and Water Control Device and Completion Tubular Column for Directional Wells", "Test Device for Resisting Internal and External Pressure of Screen Tubes", "Sealing Combination Structure", "Hydraulic Vibrator and its Sealing Combination Structure" and more than 30 patents related to oil recovery and water control.

We have opened R&D testing and test bases for product components in Shandong and Hebei and established several test laboratories, such as a performance evaluation simulation laboratory for water stabilization and control devices, a performance evaluation laboratory for screen liners, a sealing performance test, and so on.

CONOVA has established a strict and standardized R&D management system and quality management system and has an intellectual property management system certificate, ISO9001 quality management system certificate, ISO14001 environmental management system certificate, ISO45001 occupational health and safety management system certificate, HSE health, safety, and environmental management system certificate and AAA enterprise credit

rating certificate.

First level	Second level	Third level	
Technical Solutions	FloWise® Intelligent Water Control Completion Solution	Vertical and Directional Well Water Control Solution	Cement Completion
			Open Hole Completion
		Horizontal new well Water Control Solution	Open Hole Completion
			Gravel Pack Completion
		Horizontal production well Water Control Solution	Open Hole Completion
			Cement Completion
		Screen Completion	
	Intelligent layered water injection Solution	Cabled Intelligent Water Injection Solution	
Cableless Intelligent Water Injection Solution			

## 1 FloWise® Intelligent Water Control Completion Solution

CONOVA FloWise® Intelligent Water Control Completion System is a comprehensive process system that focuses on reducing water cut in oil wells, increasing oil production and enhancing oil recovery.

The features of the FloWise® Intelligent Water Control solution are as follows:

- A. Apply to sandstone, carbonate rock, volcanic rock, metamorphic rock, heavy oil reservoir, etc;
- B. Applicable to horizontal well, vertical well, directional well;
- C. Suitable for Severe heterogeneity, multi-layer development reservoir with edge and bottom water;
- D. Applied to new wells at risk of water coning and production wells where water

coning has occurred;

E. Can be applied to open hole completion, casing and screen production well re-completion;

F. One-time completion operation realizes self-adaptive water control and oil increase in the whole life cycle of oil well production;

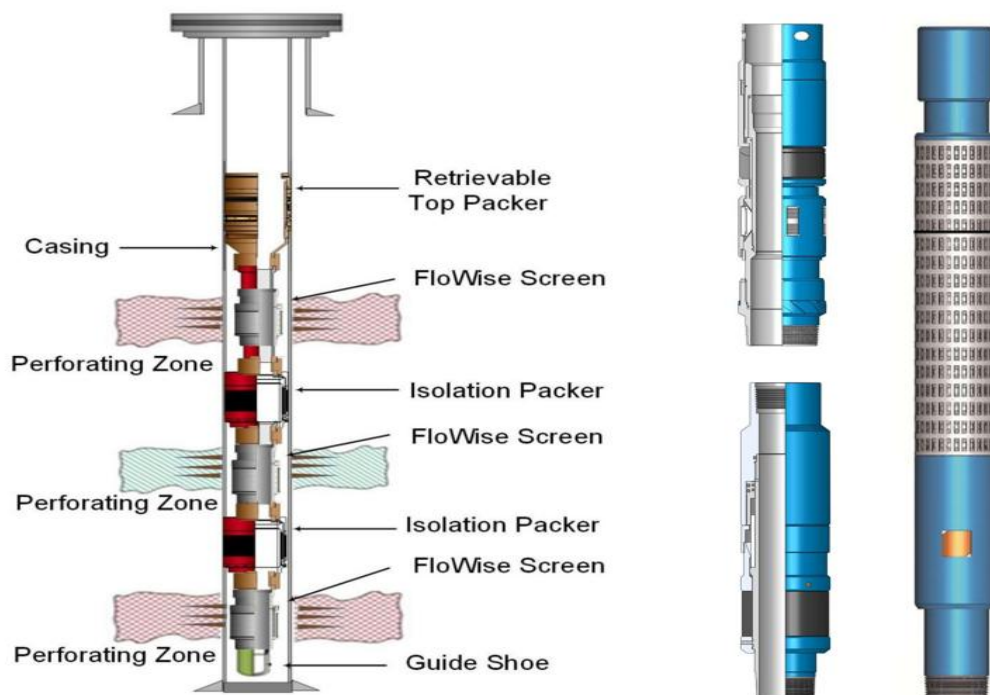
G. FloWise<sup>®</sup> water control screen has no moving parts; simple completion string, simple operation procedure and low overall cost;

H. No control lines and human intervention on the ground required, realize low-cost intelligent flow regulation and water control completion.

## (1) Vertical and Directional Well Water Control Solution

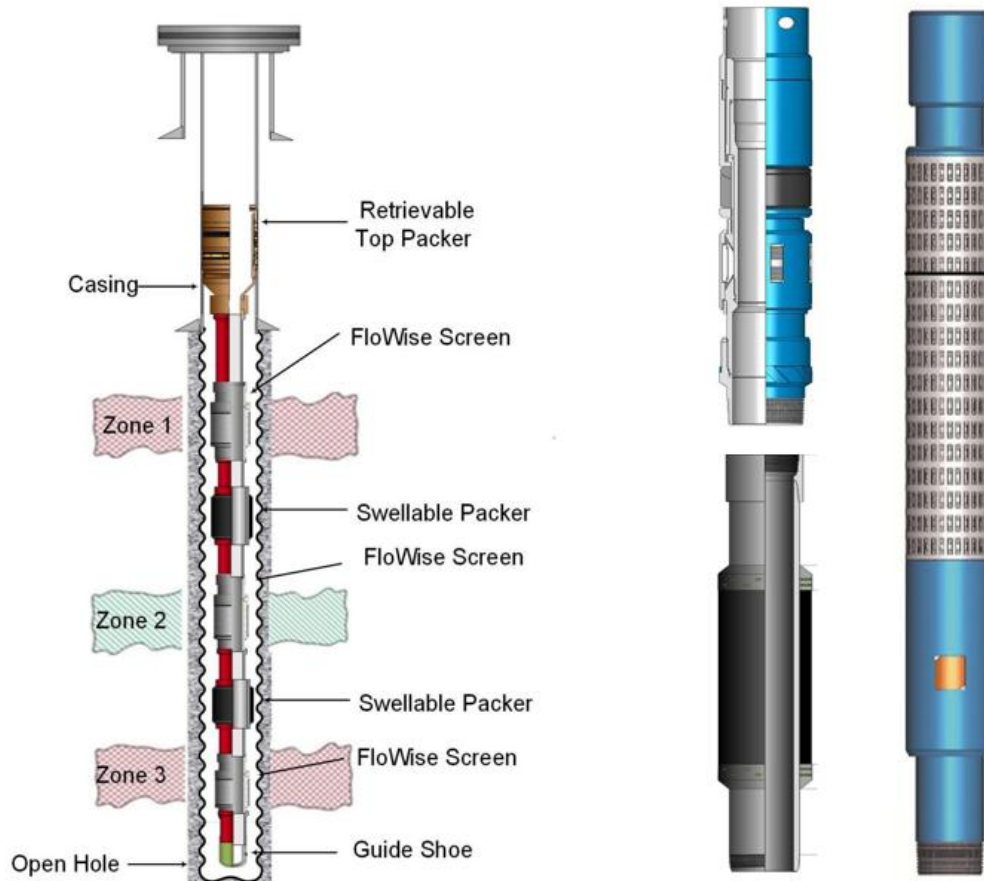
### a. Cement Completion: FloWise Screen + Isolation Packer

Completion String: Retrievable Top Packer + Blink Pipe + FloWise<sup>®</sup> Screen + Blink Pipe + Isolation Packer + Blink Pipe + FloWise<sup>®</sup> Screen + Blink Pipe + Isolation Packer + Blink Pipe + FloWise<sup>®</sup> Screen + Blink Pipe + Guide Shoe.



## b. Open Hole Completion: FloWise® Screen+Swellable Packer

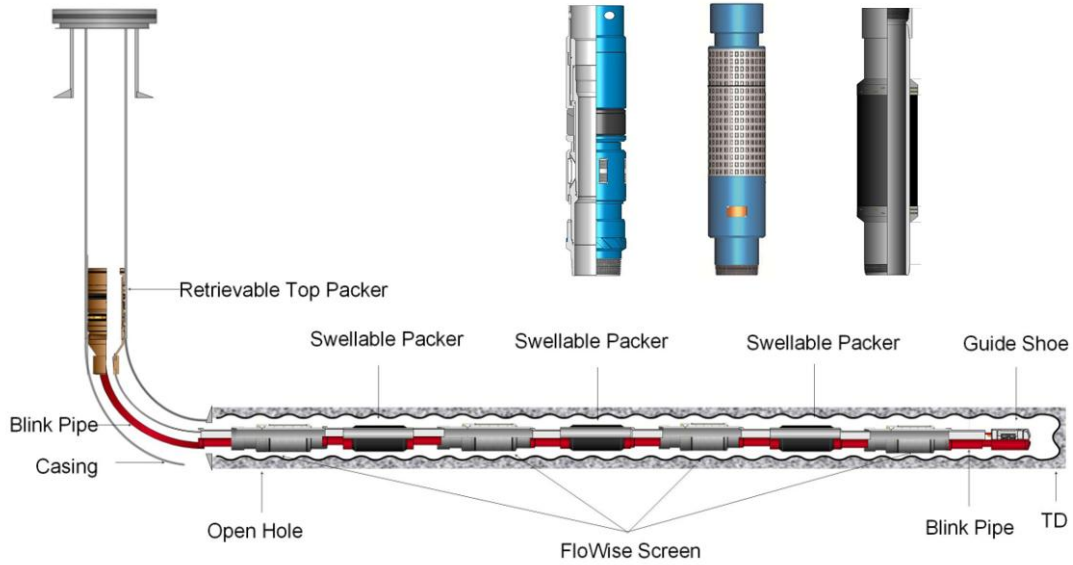
Completion String: Retrievable Top Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Guide Shoe.



## (2) Horizontal new well Water Control Solution

### a. Open Hole Completion: FloWise® Screen+Swellable Packer

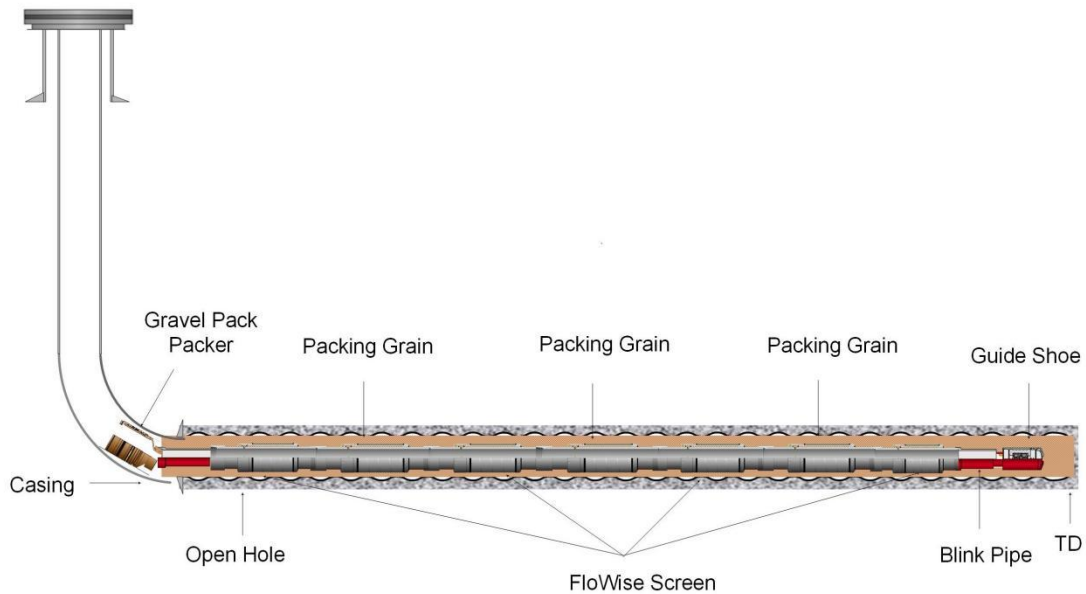
Completion String: Retrievable Top Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Guide Shoe.



## b. Gravel Pack Completion: FloWise® Screen+Packing Grains

Completion String: Gravel Pack Packer + Converter + Blink Pipe + FloWise® Screen +.....+ FloWise® Screen + Blink Pipe + Guide Shoe.

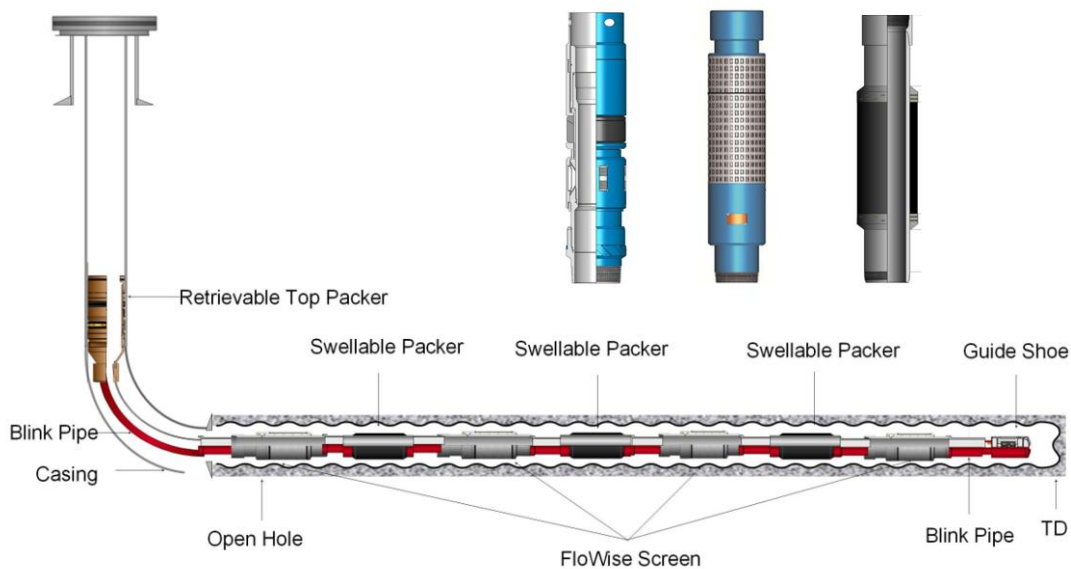
Pack low density packing Grains in the outer annulus of the FloWise® water control screen string.



### (3) Horizontal production well Water Control Solution

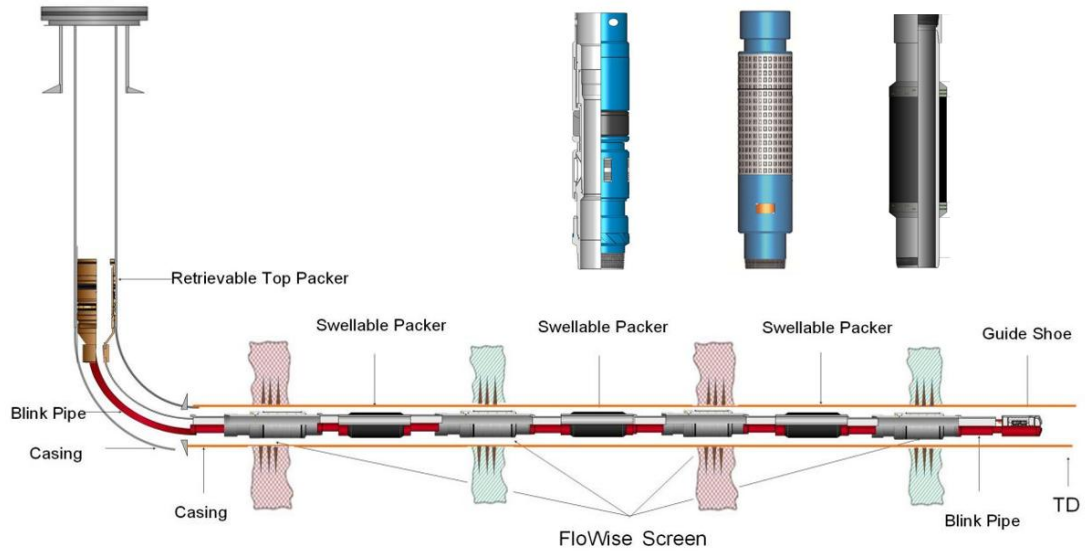
#### a. Open Hole Completion: FloWise® Screen+Swellable Packer

Completion String: Retrievable Top Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Guide Shoe.



#### b. Cement Completion: FloWise® Screen+Swellable Packer

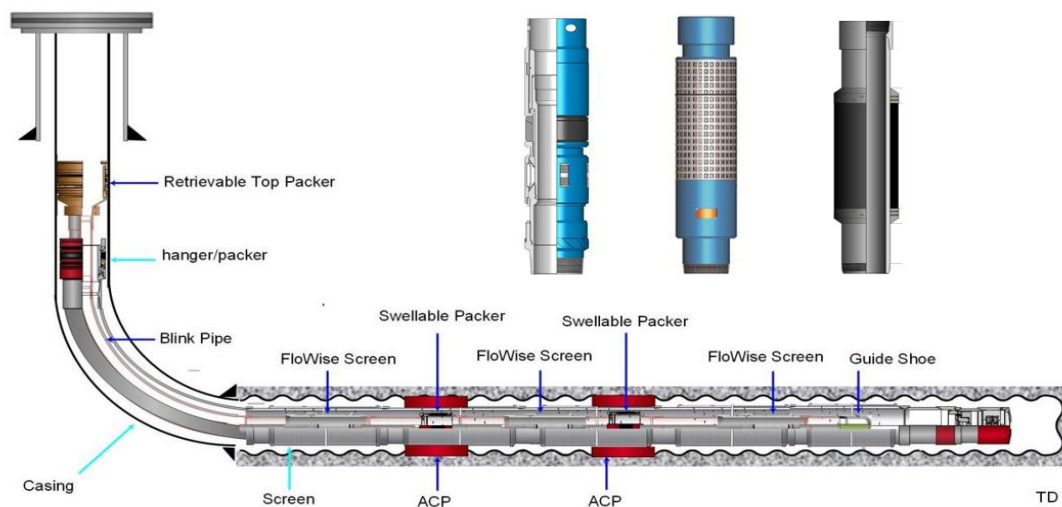
Completion String: Retrievable Top Packer+Blink Pipe + FloWise® Screen+Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen+Blink Pipe + Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe +Swellable Packer + Blink Pipe + FloWise® Screen + Blink Pipe + Guide Shoe.



### c. Screen Completion: FloWise® Screen+ACP (Annular Chemical Packer)

Inner Completion String in Screen String: Retrievable Top Packer+Blink Pipe + FloWise® Screen+Blink Pipe +Isolation Packer+ Blink Pipe + FloWise® Screen + Blink Pipe + Isolation Packer + Blink Pipe + FloWise® Screen+Blink Pipe +Guide Shoe.

Squeeze chemical packers (ACP) in the outer annulus of the screen string to separate the outer annulus of the screen string.

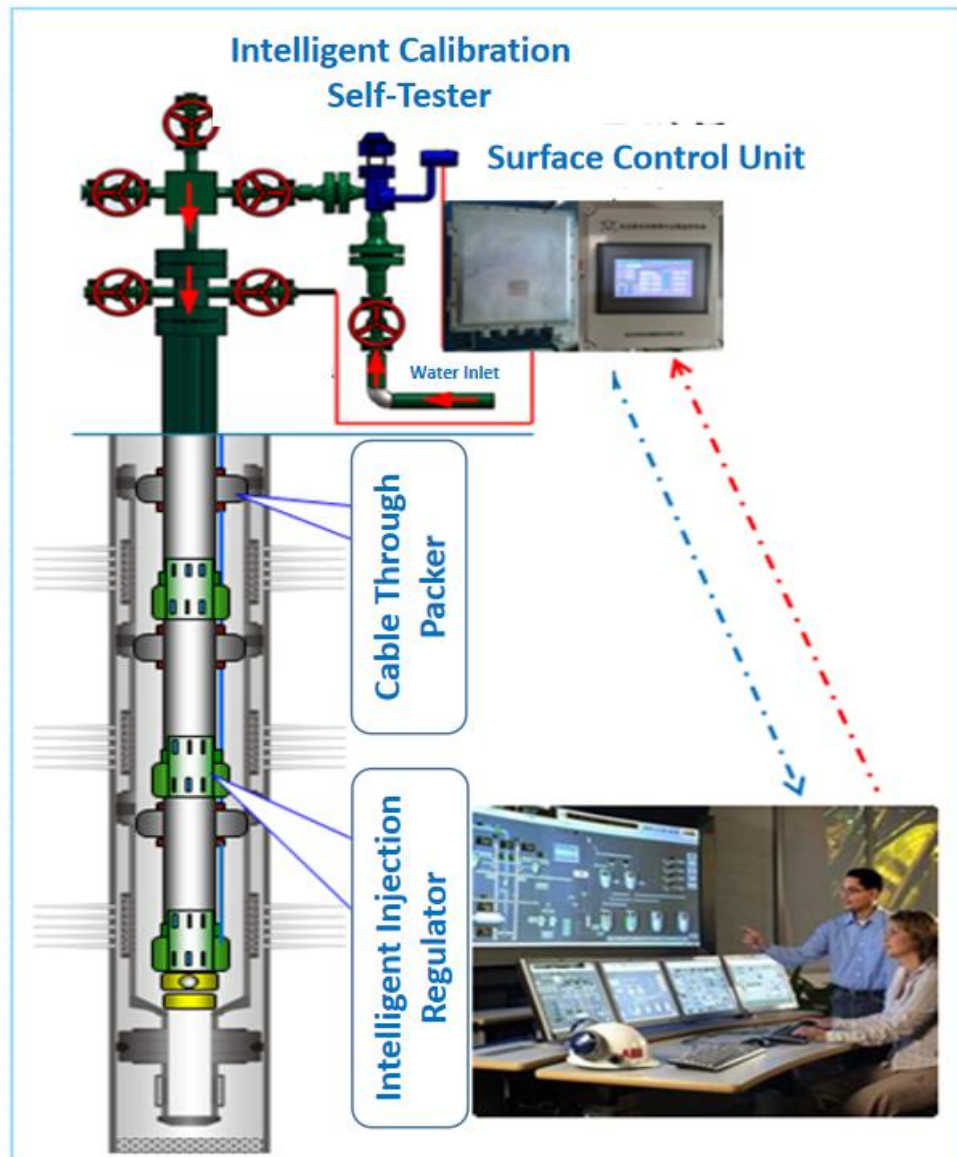


## **2 Intelligent layered water injection Solution**

### **(1) Cabled Intelligent Water Injection Solution**

- a. Each water injection layer is equipped with a cabled intelligent injection regulator, and separated by a cable through packer;
- b. The surface control unit can long-term monitor down hole flow, temperature, water injection pressure and formation pressure, and obtain the total amount of injected water in each layer in real time;
- c. Real-time monitoring of the water injection volume of each layer, real-time regulation of the valve opening, and control of the water injection volume within the allowable error;
- d. It can communicate with the remote control room, realize the real-time detection or reset of the water injection volume of each layer, check the pressure and temperature of the water injection layer, and check the sealing performance of the packer;
- e. The wellhead intelligent calibration self-tester instrument can periodically re-calibrate and calibrate the parameters of the down hole water injection regulator;
- f. The number of water injection stages is not limited. Suitable for vertical well, highly deviated well and deep well.





## (2) Cableless Intelligent Water Injection Solution

a. The cableless intelligent water injection system realizes two-way communication between the surface and the down hole through the pressure and flow carrier technology without the requirement of cable operation, low investment, and is the real wireless transmission;

b. The dual detection method of pressure and flow carrier improves the accuracy and timeliness of decoding, greatly reduces the bit error rate, and effectively

improves the reliability of wave code communication;

c. Through the remote monitoring platform, he can monitor the down hole layered flow, layered water injection pressure, formation pressure, temperature and other parameters of the water injection well in real time;

d. It can realize the coordinated communication and control of the down hole, ground and base, and realize the layered measurement and adjustment of water injection wells, well management and dynamic monitoring without the need of other supporting equipment and personnel;

e. Low power consumption, 3-year power consumption is less than 60% of the total battery power;

f. There is no need of down hole cable operation, the risk of completion work is low;

g. It is suitable for vertical well, highly deviated well and horizontal well with few injection stages and shallow well depth;

h. When the number of water injection layers is large and the permeability coefficient is not uniform, it is difficult to regulate the cableless intelligent water injection regulator.

