

Waterflood-Injection Systems



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Achieve an even, efficient sweep with Weatherford's waterflood-injection systems. Weatherford's versatile systems of regulator valves and side-pocket mandrels provide the injection rates and reliable operation operators need to effectively manage waterflood-injection performance. In high-injection-rate applications, clients can rely on Weatherford's unique dual systems for maximum rates with minimal casing wear. In lower-rate applications, standardized system components are interchangeable with other products for operational convenience and increased dependability.

Worldwide, Weatherford's waterflood-injection systems serve single-zone and multiple-zone applications in a range of tubing sizes from 2-3/8 to 4-1/2 in. In the various field locations, multiple-zone completions have numbered into the hundreds or thousands, with single-well injection rates up to 25,000 bwpd. Many of these installations have benefited from Weatherford's expertise and technology for almost a decade.

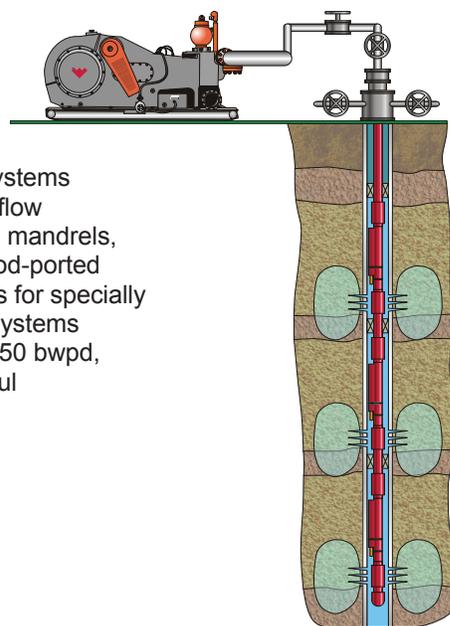
Features, Advantages and Benefits

Simple, reliable, and cost-effective, Weatherford's waterflood systems significantly reduce operational complexity and expense by

- reducing the number of injector wells and tubing strings and the wellbore diameter;
- minimizing surface and completion equipment;
- stabilizing surface injection pressure;
- maintaining flow-rate at the injection zone.

Simple Design, Maximum Dependability

Weatherford's waterflood-injection systems are based on a full range of reverse-flow regulators for standard tubing-ported mandrels, standard-flow regulators for waterflood-ported mandrels, and unique dual regulators for specially ported waterflood mandrels. These systems provide injection rates from 60 to 5,550 bwpd, providing all the options for successful waterflood management.





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Regulators and Valves

Dual and Standard Regulators

RWF series 1- and 1 1/2-in. outside diameter (OD) regulator valves provide an efficient method of regulating water volumes injected down a single tubing string into multiple packer-isolated zones.

Standard RWF series regulators provide injection rates from 60 to 2,700 bwpd. The regulator, latch, and mandrel components of these systems are interchangeable with most major brands.

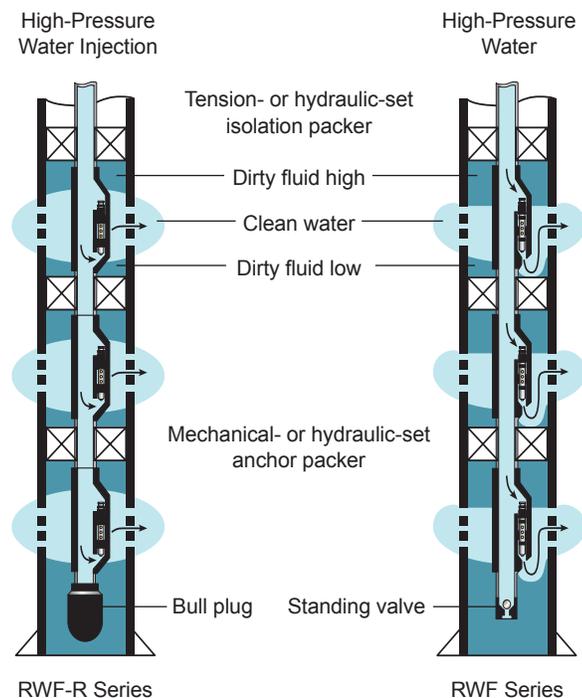
RWF-R series 1- and 1 1/2-in. OD reverse-flow regulator valves are used in standard tubing-ported mandrels. These regulators provide injection rates from 60 to 1,000 bwpd.

Specialized Waterflood Valves

For some applications, RO-WF series orifice valves are used to control water volumes injected into individual zones. This typically occurs on the initial injection startup or when injection rates exceed the maximum rates of regulator valves. The injection rate is dependent on port size and varies with the pressure differential.

ED series equalizing dummy valves are installed with the well completion as a means of testing and setting isolation packers.

ED-WFD series equalizing dummy valves and RO-2WFD series orifice valves are used with SBRO-2WFD special dual-ported waterflood mandrels.



Typical well schematics showing the flow direction or injection direction as water travels through the RWF-R and RWF series regulators.



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Brazilian Waterflood Project



Job site in Brazil prepares for waterflood operations.



Waterflood valve inspected and prepared for assembly.



Night installation of Weatherford's waterflood injection system.

Waterflood Services

Weatherford has extensive global experience in waterflood operations. In addition to waterflood-injection systems, we provide isolation packers and surface equipment for monitoring and controlling injection pressure, injection rate, and temperature.

The combination of computer analysis, quality products, global distribution, and experienced personnel brings our clients answers to the most difficult waterflood challenges without the added expense of multiple suppliers, multiple billing, and multiple crews on-site.

Waterflood Services

Region/ Location	Well Completion Type or Application	Number of Injection Wells	Total Service Time (years)	Fluid Rates (BWP/D)	Number of Mandrels per Well
Argentina	Multizone water injection	400+	10+	300 to 1,000	5 to 15
Colombia	Multizone water injection	250+	4	200 to 1,200	7 to 12
USA	Multizone water injection	10+	10	500 to 1,000	2, 3
	Single-zone water injection	40+		2,000 to 8,000	1, 2, 3
		25+	5	1,000 to 5,000	1, 2
West Africa/ Angola	Multizone water injection	75+	7	8,000 to 25,000	3, 4