

ResInject

Injection ICD

APPLICATIONS

- Injection wells requiring flow control
- Vertical, deviated, and horizontal completions
- Openhole stand-alone completions
- Homogenous and heterogeneous sandstone and carbonate reservoirs

BENEFITS

- Ensures uniform areal and vertical sweep by balancing out the injection profile
- Restricts injection fluid through high-permeability zones
- Delays injection fluid breakthrough in production wells
- Provides simple injection management of multiple zones in openhole completions
- Ensures safer and more efficient installation of the lower completion because of mechanically robust assembly
- Has removable housing for wellsite nozzle optimization based on LWD data

FEATURES

- A designed pressure drop is achieved through the combination of ceramic nozzles.
- The pressure drop across the nozzles is independent of fluid viscosity (Bernoulli's principle).
- Low-permeability zones receive more injection fluid than in a normal screen completion and thereby increase hydrocarbon recovery.
- Optimal completion design with the injection ICD is modeled using Schlumberger best-in-class steady-state and dynamic simulators.
- The device has been validated through extensive flow, erosion, and mechanical integrity testing.

The ResInject* injection ICD is designed to optimize injection in openhole completions by balancing the injection profile along the entire length of the wellbore. In high-permeability zones, it exerts higher backpressure than in other zones because of the higher fluid velocity (ΔP is proportional to linear velocity squared). Consequently, low-permeability zones receive more injection fluid than in normal screen completions; therefore, hydrocarbon recovery is increased.

Integrated system

The injection ICD, combined with the unique strength and accuracy of a Schlumberger sand screen, becomes an injection management system in which sand control and injection control are intelligently integrated in a simple, robust, and reliable solution. This integration is achieved without the need for downhole telemetry; the system is self-regulating by design. The robust injection ICDs are installed like casing and require no cables or control lines.

Injection ICD construction

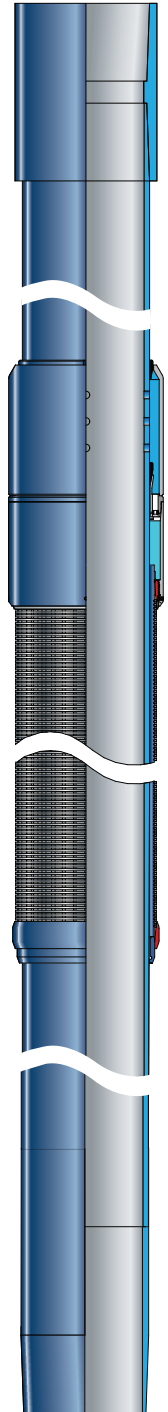
Each joint includes a sand screen on unperforated basepipe with a ResInject injection ICD housing located at the end of the screen. The injection fluid enters the housing, flows through the nozzles into the screen section between the screen medium and basepipe, and then flows into the reservoir. For carbonate reservoirs, the screen section is shortened, providing a cost-efficient debris barrier to avoid plugging of the nozzles.

Benefits

An important advantage of the ResInject injection ICD is its ability to minimize the risk of bypassing reserves, thereby increasing recovery. Because of its robustness and simplicity, it also contributes to reduced development and well intervention costs and to prolonged completion life.

Combined inflow and injection control

When multiple wells across a field are being managed, reservoir modeling and optimization of producer and injector interaction using both the ResInject injection ICD and the ResFlow* ICD offer additional reservoir management benefits. The Schlumberger in-house ICD Advisor planning software allows engineers to design the optimal solution for each set of reservoir conditions.



ResInject injection ICD.

ResInject

ResInject Injection ICD Specifications

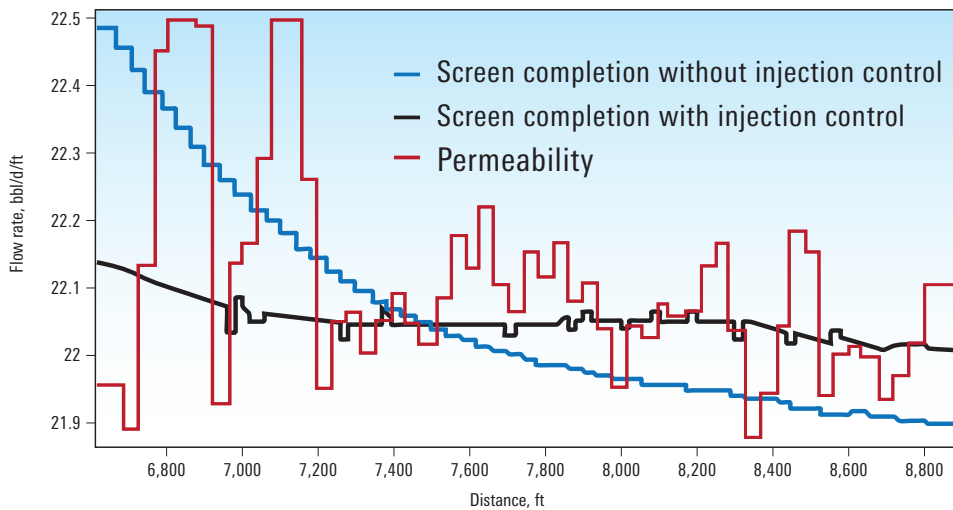
Basepipe Size, in	Basepipe Weight, lbm/ft	Min. Basepipe ID, in	Additional Assembly Weight, [†] lbm/ft	Max. Screen OD, in	Max. Tensile Rating, [‡] lbf	Max. Torque Rating, ^{‡,§} lbf.ft	Max. Collapse Rating, [‡] psi		Max. Burst Rating, [‡] psi	
							Housing		Housing	
							316L	4140	316L	4140
3.500	9.2	2.99	5.2	4.92	175,100	8,500	2100	3050	1900	3050
4.000	9.5	3.55	5.2	5.42	185,800	12,400	1,937	2,754	1,711	2,745
4.000	11.0	3.48	5.2	5.42	213,100	11,000	1,937	2,754	1,711	2,745
4.500	11.6	4.00	5.5	5.92	235,500	15,800	1,800	2,500	1,550	2,450
4.500	12.6	3.96	5.5	5.92	253,900	17,200	1,800	2,500	1,550	2,450
5.000	15.0	4.41	6.0	6.42	312,700	22,400	1,664	2,257	1,412	2,259
5.000	18.0	4.28	6.0	6.42	376,300	26,200	1,664	2,257	1,412	2,259
5.500	17.0	4.89	6.6	6.92	358,600	26,600	1,550	2,050	1,300	2,100
5.500	20.0	4.78	6.6	6.92	420,800	34,100	1,550	2,050	1,300	2,100
6.625	20.0	6.05	7.8	8.05	422,500	41,000	1,400	1,750	1,150	1,750
6.625	24.0	5.92	7.8	8.05	510,800	48,600	1,400	1,750	1,150	1,750
6.625	28.0	5.79	7.8	8.05	598,200	55,894	1,400	1,750	1,150	1,750
7.000	23.0	6.37	8.2	8.42	492,500	49,200	1,366	1,681	1,128	1,696

[†] Data based on 32-ft filter.

[‡] Data based on 12 GA, 316L, direct-wire-wrapped screen, 80,000-psi basepipe, R3, SLHT.

[§] Torque value based on 80,000-psi, SLHT coupling.

Note: ISO certifications are available on request.



The ResInject injection ICD balances the water injection profile, even when the reservoir has variations in permeability and a large heel-to-toe-effect.

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