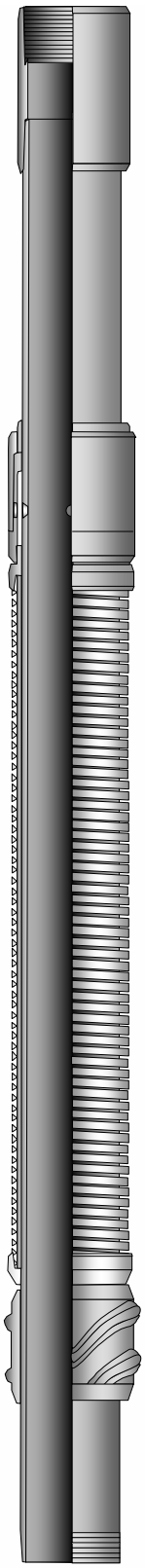


ResFlow™ Well Production Management System

Application:

ResFlow™ is designed to optimize production from horizontal OH completions by equalizing the reservoir inflow along the entire length of the wellbore. ResFlow™ combined with the LineSlot™ sand control screens becomes a production management system where sand control and flow control is intelligently integrated in a simple, robust and reliable solution. This functionality is achieved without the need for downhole telemetry.

Benefits:

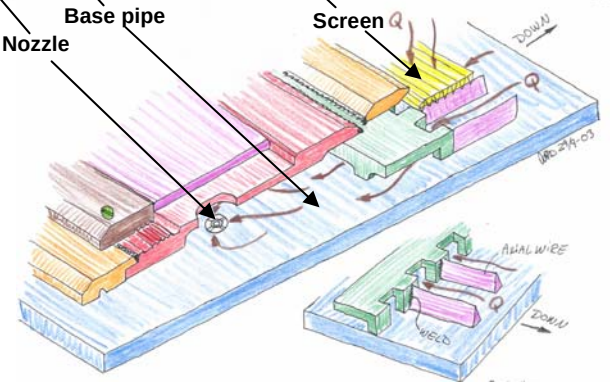
- Ensures an even reservoir flux and a uniform production profile along the entire producing interval, thereby delaying water or gas breakthrough
- Significantly reduces water cut or high GOR
- Maximizes well productivity
- Provides production management of multiple zones in open hole completions
- Reduces field development costs
- Increases recoverable reserves
- Increases completion longevity
- Mechanically robust assembly ensures safe and efficient installation of the lower completion

Features:

- Each screen joint is equipped with a ResFlow™ nozzle chamber. Screens are wrapped on un-perforated base pipe.
- Fluid enters the screen, flows between screen jacket and base pipe into housing and through nozzle
- Pressure drop is achieved through combination of two or four ceramic insert nozzles
- Pressure drop in nozzle is independent of fluid viscosity; no adjustments are required when water cut or GOR increase
- No need for permanent well instrumentation
- No control lines to install
- Nodal analysis software (NETool™) for selection of correct nozzle combination
- Correct pressure drop (toe to heel) is obtained by installing the selected combination of nozzles
- Nozzles are installed on surface prior to installing the completion
- Nozzle installation takes place without using rig time, (screens on pipe rack)
- Screens are installed as casing
- No handling of heavy objects on rig floor

Norway:	*Kongsgata 21, N-4330 Ålgård, Norway*	*Tel.: + 47 51 61 21 00*	*Fax: + 47 51 61 21 01*	*E-mail:*	*web:*
USA:	*1121 Buschong Rd, Houston, Texas 77039 USA*	*Tel.: + 1 281 227 9854*	*Fax: + 1 281 227 6834*	*reslink@reslink.com*	*www.reslink.com*

ResFlow™ Well Production Management System



Basic Principle:

- Produced fluids enters through screen, flows along wire wrap / base pipe "annulus" to nozzle chamber and then into the base pipe through ceramic nozzles.
- A controlled pressure drop is introduced to equalize pressure drop in base pipe and compensate for pipe friction drop and/or permeability contrasts
- Pressure drop through a nozzle is based on *Bernoulli's Equation*

Bernoulli's Equation: $\Delta p = \rho \frac{v^2}{2}, v = \frac{q}{A}$

Δp: pressure drop, ρ: fluid density, v: velocity, q: flow rate, A: cross sectional area

Eq. (1)

- Pressure drop in the reservoir is based on *Darcy's Equation:*

Darcy's Equation: $\Delta p = q \frac{\mu L}{kA}$

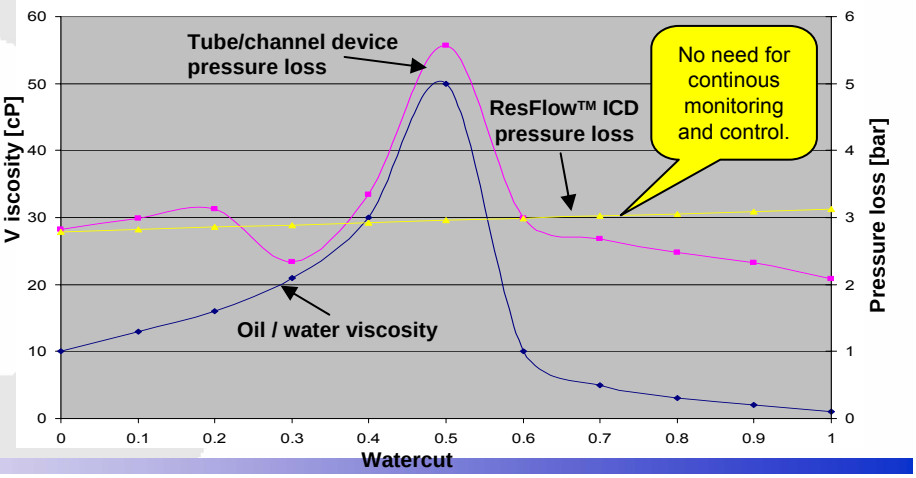
Δp: pressure drop, q: flow rate, μ: fluid viscosity, L: length of well, k: formation permeability, A: cross sectional area

Eq. (2)

ResFlow™ design philosophy:

Pressure drop may be generated by flowing through a nozzle or through a pipe or tube. Pressure drop across a nozzle and a tube are both described by the Bernoulli equation, however pressure drop through a tube will be dominated by fluid viscosity. Since pressure drop through a nozzle is unaffected by fluid viscosity, Reslink has chosen the nozzle based principle for flow control.

The difference in performance between the tube/channel device and the nozzle is clearly illustrated. The change in pressure drop as a function of viscosity due to change in water cut in a heavy oil application is seen. ResFlow™ is unaffected of viscosity changes and results in a constant pressure drop regardless of change in water cut.

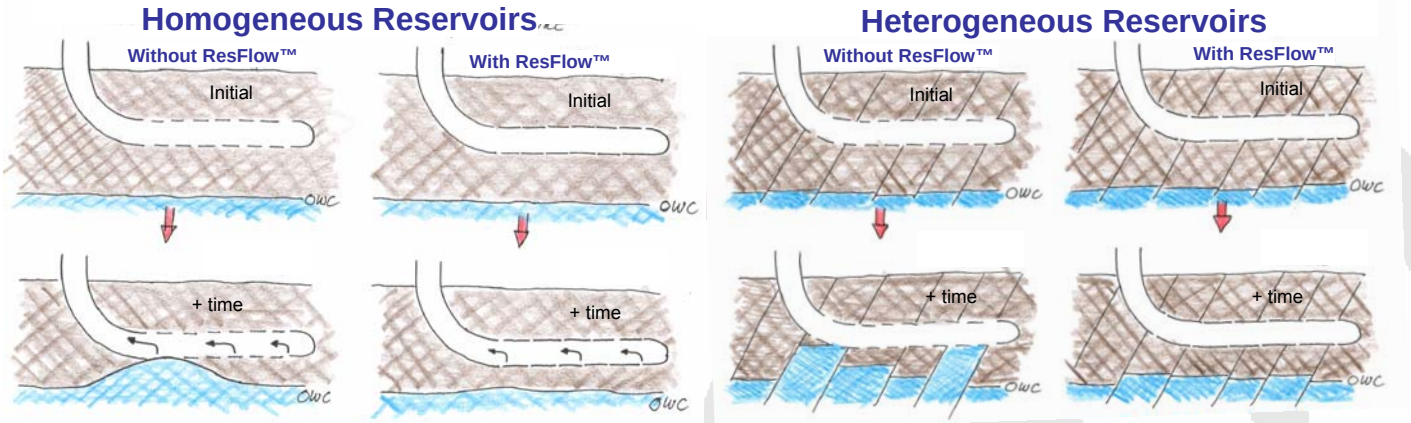


Norway: Kongsgata 21, N-4330 Ålgård, Norway Tel.: + 47 51 61 21 00 Fax: + 47 51 61 21 01 E-mail: reslink@reslink.com web: www.reslink.com

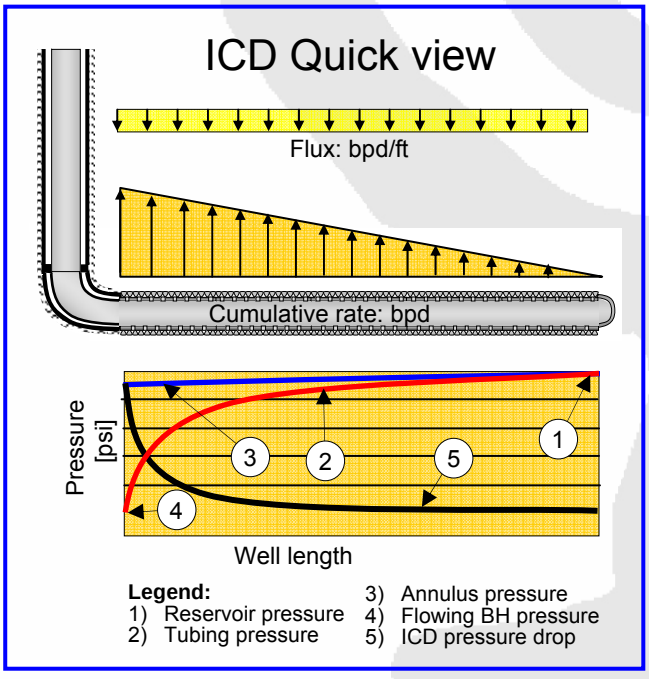
USA: 1121 Buschong Rd, Houston, Texas 77039 USA Tel.: + 1 281 227 9854 Fax: + 1 281 227 6834

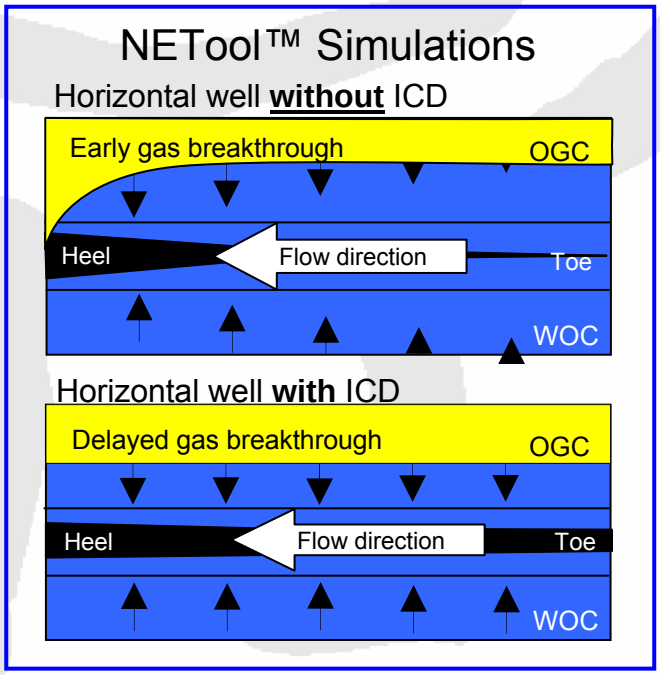
Reservoirs and conditions suited for ResFlow™:

- Homogeneous reservoir,
- Heterogeneous reservoir
- Unfavorable viscosity or mobility relationships; e.g. heavy oil reservoirs
  - eliminate the heel-toe effect
  - reduce water coning, delay water breakthrough, reduce water cut, - resulting in increased oil production
  - reduce gas coning, delay gas breakthrough, reduce gas cut, - resulting in increased oil production
  - significantly reduce the effects of permeability contrasts in heterogeneous reservoirs, - resulting in improved reservoir recovery and increased oil production
  - significantly reduce water production and improve oil production in heavy oil reservoirs



ResFlow™maintain production when reservoirs act differently than anticipated



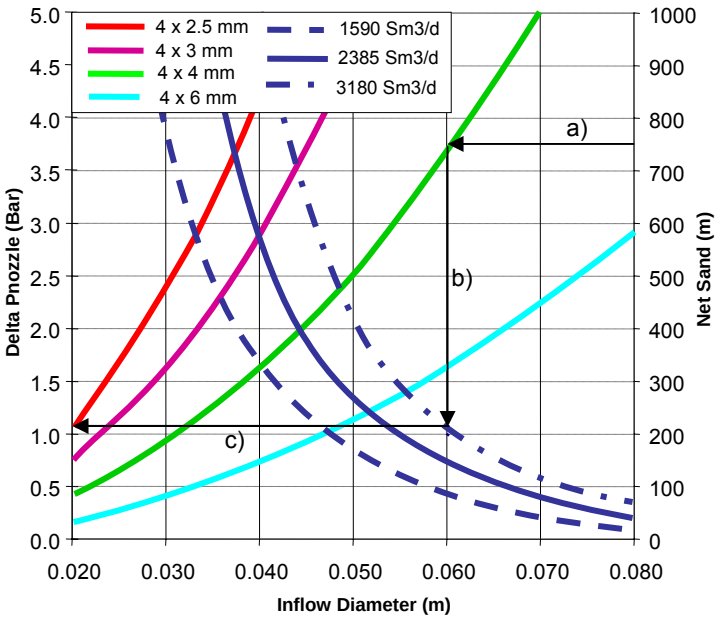


Norway: *Kongsgata 21, N-4330 Ålgård, Norway* *Tel.: + 47 51 61 21 00* *Fax: + 47 51 61 21 01* *E-mail:* *web:*
USA: *1121 Buschong Rd, Houston, Texas 77039 USA* *Tel.: + 1 281 227 9854* *Fax: + 1 281 227 6834* *reslink@reslink.com* *www.reslink.com*

ResFlow™ Well Production Management System

ResFlow™'s unique balancing effect is based on the basic physics and the interaction between reservoir and completion. The pressure drop across the nozzles is a function of the rate squared, Eq. (1), while the pressure drop in the reservoir is a linear function of the rate, Eq. (2).

As a consequence, ResFlow™ supresses high flow rates by introducing an additional pressure drop in the completion and stimulates flow from low rate intervals by reducing the pressure drop into the completion. This reduces the heel-toe effect, delays coning and increases production and ultimate recovery.



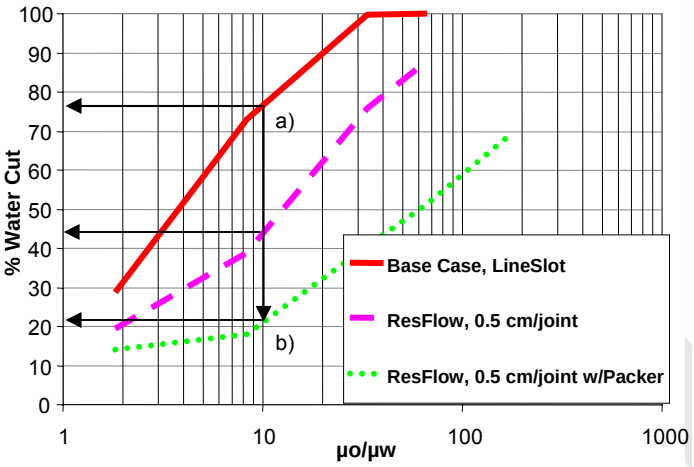
Field example: Viscosity: 3.8 cP, Density: 913 kg/m³

a) Select net sand completion length

b) Select nozzle size (nozzles per joint, approx. 12 m) and select production rate

c) Read off the pressure drop through nozzles

Relative Viscosity, Oil/Water



When water or gas breaks through, the less viscous phase tends to "take over" the production due to the higher mobility, Eq. (2). ResFlow™ reduces this effect, since the flow through the nozzles is controlled by both the density and rate squared, Eq. (1). The figure above shows an example of a decrease in water cut from a) **77%** in a standard completion to b) **22%** with ResFlow™.

This effect is even higher for gas, since viscosity difference can be in the order of 1000, while the density difference is in the order of 10.

As a function of completion lenghts and production rates, different nozzle settings are simulated. Performance curves are generated by simulating different sizes as a function of completion length and production rates.

The ability to regulate unforeseen variations in the reservoir increases in a ResFlow™ completion with increasing pressure drop over the nozzles

Norway:	*Kongsgata 21, N-4330 Ålgård, Norway*	*Tel.: + 47 51 61 21 00*	*Fax: + 47 51 61 21 01*	*E-mail:*	*web:*
USA:	*1121 Buschong Rd, Houston, Texas 77039 USA*	*Tel.: + 1 281 227 9854*	*Fax: + 1 281 227 6834*	*reslink@reslink.com*	*www.reslink.com*

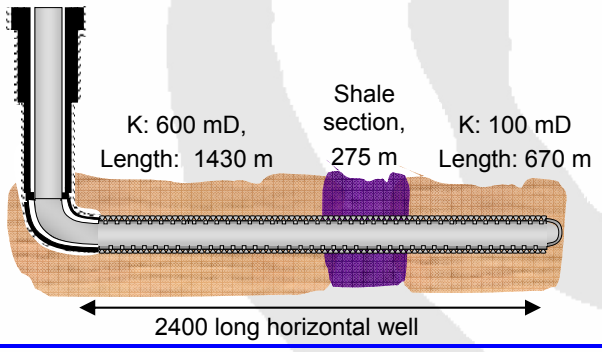
ResFlow™ Well Production Management System

ResFlow™ Placement Determination:

Reslink utilizes the completion modeling and NODAL analysis software NETool™, to perform sensitivity analysis for different completion options, placement and sizing of ResFlow™ nozzles. This program allows for quick computation of the well production profile while honoring the reservoir description and up-scaling the reservoir data.

The process for a ResFlow™ completion placement is illustrated below. The example has a shale section which is isolated with a zonal isolation devise, such as the Swell Packer™. ResFlow™ is applicable in screen only completions as well as gravel packed completions with or without dedicated zonal isolation devices installed.

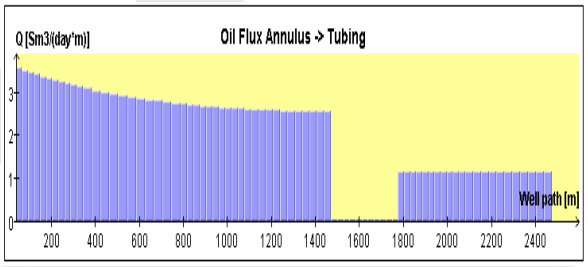
1



Identify wellbore and reservoir properties. Establish final well geometry and trajectory.

2

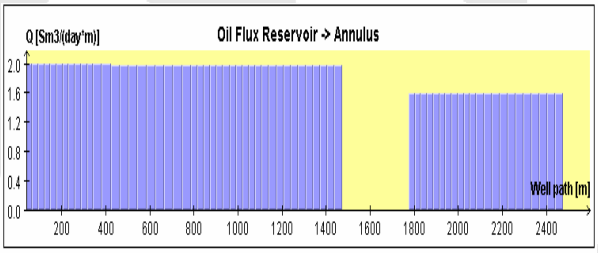
7" Cased, Cemented & Sel. Perf'd Completion



First 4700 ft shot at 1 spf and last 2200 ft shot at 4spf
Heel section main contributor
Little change in production rate with increased perf,s at toe

2a

6-5/8" Screen in 8.5" OH w/ ResFlow™ ICD & zone isolation



First 1430 m has ICD (1ea - 1/8" diameter) every 12 m
Last 670 m has ICD (4ea – 5/8" diameter) every 12 m
Zonal Isolation Device in annulus for isolation of zones
Both zones are contributing almost equally

NETool™ is used to model and optimize different completion scenarios. Objective is even flux from all zones.

3

Scenario	Draw down psi	Total Prod. BOPD	Influx 100 mD BOPD/ft	Influx 600 mD BOPD/ft	% Prod. from 100 mD zone	NPV over 10 years MM$
7" Cased, Cemented & Perforated (Compl. Cost 6.5 MM$)	98 @ toe 142 @ heel	30,657	2.3	5.75 – 6.7	26 %	870.5
6-5/8" Screen only with ResFlow™ & Zonal Isolation Device (Compl. Cost 3.2 MM$)	110 @ toe 23 @ heel	24,757	3.1	3.8	45 %	1077.9

Evaluate the best production scenario from modeling. Select the scenario that minimize coning and maximize oil contribution from the reservoir.

Norway: *Kongsgata 21, N-4330 Ålgård, Norway* *Tel.: + 47 51 61 21 00* *Fax: + 47 51 61 21 01* *E-mail:* *web:*
USA: *1121 Buschong Rd, Houston, Texas 77039 USA* *Tel.: + 1 281 227 9854* *Fax: + 1 281 227 6834* *reslink@reslink.com* *www.reslink.com*