STREAMLINES

TECHNOLOGY LIBRARY 2026 · 155 SLIDES

Technology Library

Surveillance, diagnosis and engineering first: every Streamlines technology, with the original slides rebuilt in detail and linked from one agenda.

Open the agenda →

Technology index →

Start with surveillance →

01
Production & Technology

02
Consultancy & Engineering

03
Software Solutions

04
Training & Development

Streamlines Energy · Cairo, Egypt · www.slsog.com · Home, Agenda and Technologies buttons on every slide

Agenda

Click any line to jump; every slide links back here.

Company

- Services provided →
- Who we are →
- Leadership →
- Our four streamlines →
- How the streamlines work together →
- Quality, HSE and standards →

STREAMLINE 01

Production & Technology

- 1.1 Field Surveillance →
- 1.2 Well Diagnostics →
- 1.3 Well Testing →
- 1.4 Well Integrity Management →
- 1.5 Well Intervention →
- 1.6 Production Optimisation →

STREAMLINE 02

Consultancy & Engineering (CISS)

- Consultancy overview →
- Surveillance engineering →
- Production engineering →
- Capacity, deferral and integrity →
- Practice areas →
- How studies are delivered →

STREAMLINE 03

Software Solutions

- Software overview →
- tNavigator →
- Interactive Petrophysics →
- Peloton →
- Quorum →
- WelliRS →

STREAMLINE 04

Training & Development

- Upstream catalogue →
- Downstream programme →
- How training is delivered →
- Value and cases →

Working with Us

- Technology partners →
- How we engage →
- Where to start →
- Why Streamlines →
- Summary →
- Contact →

Technology Index

Every technology and capability, one click away.

STREAMLINE 01 · PRODUCTION & TECHNOLOGY

1.1 Field Surveillance

- Testing services →
- Downhole gauges →
- Clamp-on flow meter →

1.2 Well Diagnostics

- Noise & temperature logging →
- EPDT →
- Echometer →

1.3 Well Testing

- Two-phase flow meter →
- Smart MPFM →
- Mobile MPFM →

1.4 Well Integrity Management

- WIT / SIT testing →
- Bismuth alloy →

1.5 Well Intervention

- Velocity strings →
- Torque Action Debris Breaker →
- Electrical cutting tool →
- Eclipse toolbox →

1.6 Production Optimisation

- SST gas-lift tool →
- Artificial lift →
- Surge Disk →
- EOR and PSC →
- Inflow control →
- Production chemicals →

Consultancy & Engineering (CISS)

- Surveillance engineering →
- Production engineering →
- Capacity, deferral and integrity →

Software Solutions

- tNavigator →
- Interactive Petrophysics →
- Peloton →
- Quorum →
- WelliRS →

Training & Development

- Upstream catalogue →
- Downstream programme →
- How training is delivered →

STREAMLINES ENERGY

Company

Who we are, what we provide, our leadership and how the four streamlines work together.

01 Services provided →

02 Who we are →

03 Leadership →

04 Our four streamlines →

05 How the streamlines work together →

06 Quality, HSE and standards →

COMPANY · ORIGINAL OVERVIEW

Services Provided by Streamlines

Training

- Provide comprehensive upstream training programmes.
- Run all training through competent, highly expert instructors.

Training & Development →

Consultation

- Provide a comprehensive quality management system that drives excellence across every study and project phase, from initial planning through final delivery.

Consultancy & engineering →

Software

- tNavigator
- Peloton
- WelliRS (well integrity)
- Tachyus

Software Solutions →

Field Operations

- Flow measurement
- Well intervention tools
- Production enhancement
- Asset integrity

Production & Technology →

COMPANY

Who We Are

Streamlines Energy is an Egypt-based oil and gas technical services company. We bring field technologies, engineering studies, industry software and structured training to operators under one accountable agreement.

Upstream and downstream

Services for producing fields, gas plants, refineries and petrochemical facilities.

Principal-backed technology

Field technologies and software delivered with their manufacturers' engineering behind ours.

Cairo engineering bench

Engineers, advisors and trainers from Egypt's major joint-venture operators, onshore and offshore.

ISO 9001 · 14001 · 45001 certified | EGPC-registered | Headquartered in El Mokattam, Cairo | We Create the Stream

COMPANY

Leadership

AD

Eng. Abdelmaksoud Desoky

GENERAL MANAGER

39+ years in E&P development, well operations, integrity and production technologies across Africa, the Middle East and Asia.

NS

Eng. Nabil Salah

NON-EXECUTIVE DIRECTOR

Leads company transformation, the growth of consultancy and integrated solutions, and subsurface technology innovation; represents the company with clients.

MZ

Eng. Mohamed Zahran

DEVELOPMENT & GROWTH MANAGER

22+ years in reservoir and subsurface engineering, field development, mega-project delivery and strategic portfolio management.

SE

Eng. Saeid El-Shorbagi

OPERATIONS MANAGER & PRODUCTION ADVISOR

Leads field operations and production advisory across the Production & Technology service lines.

HR

Mrs. Hadeer Rabie

SERVICE MANAGER

Leads service management and coordination across the four streamlines.

COMPANY

Our Four Streamlines

01 Production & Technology (P&T)

Measure, diagnose, protect and restore producing wells.

Field Surveillance · Well Diagnostics · Well Testing · Well Integrity Management · Well Intervention · Production Optimisation

02 Consultancy & Integrated Solutions (CISS)

Engineering studies built on our experts and our software.

Subsurface & Reservoir · Reserves, FDP & Portfolio · Production & Wells Engineering · Process & Facilities · Asset Performance & Cost · HSSE & Integrity

03 Software Solutions

Industry platforms, implemented, integrated and trained.

tNavigator · Interactive Petrophysics · Peloton · Quorum Energy Suite · WelliRS

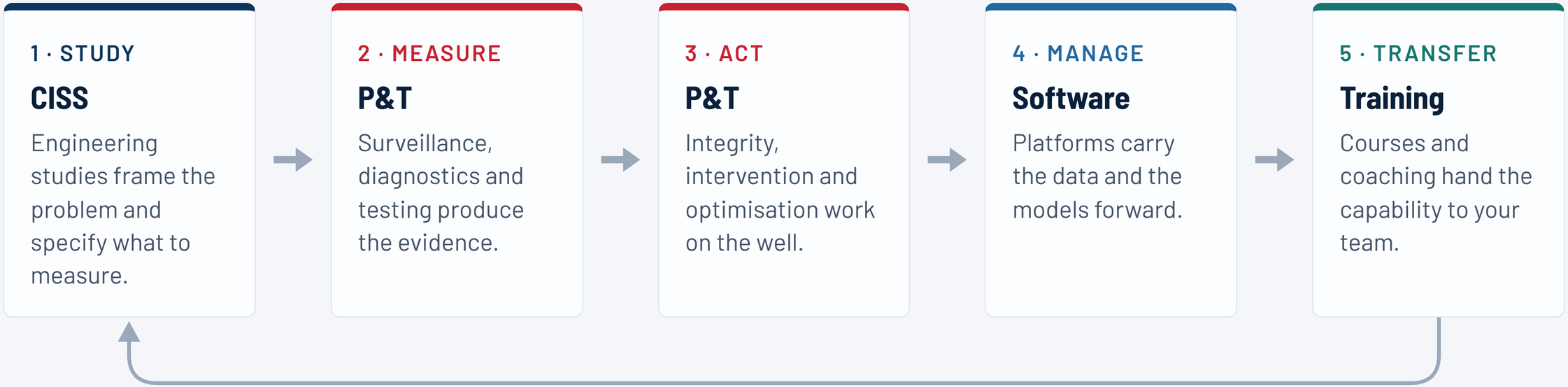
04 Training & Development

Competency built across upstream and downstream.

685-course upstream L&D calendar across seven departments · 500-course downstream catalogue for refineries, petrochemical and gas plants

COMPANY

How the Streamlines Work Together



Studies specify the measurements; measurements feed the software; the software carries the models our consultants build; training transfers all of it to your team. Close-out results open the next study.

COMPANY

Quality, HSE and Standards

9001 ISO quality management system, certified

14001 ISO environmental management system, certified

45001 ISO occupational health and safety management system, certified

EGPC Registered service provider to Egypt's petroleum sector

STANDARDS OUR WORK REFERENCES

Area	Reference
Reserves and resources	SPE-PRMS, SEC reporting rules
Well integrity	ISO 16530, API RP 90 annular pressure
Sour service	NACE MR0175 / ISO 15156
Offshore lifting	DNV 2.7-1 / EN 12079 equipment
Measurement	API, AGA and GPA measurement standards
Process safety	CCPS risk-based process safety

01

STREAMLINE 01

Production & Technology

Surveillance and diagnosis first: measure, diagnose, protect and restore producing wells with field-proven technology and our own engineering.

Map Service map →

1.1 Field Surveillance
15 slides →

1.2 Well Diagnostics
16 slides →

1.3 Well Testing
13 slides →

1.4 Well Integrity Management
10 slides →

1.5 Well Intervention
11 slides →

1.6 Production Optimisation
19 slides →

STREAMLINE 01 · P&T

P&T Service Map

1.1 Field Surveillance

Memory, SRO and wireless gauges
Real-time monitoring and control
Clamp-on ultrasonic flow surveys
Gas-lift and injection-rate surveys
Acoustic fluid-level surveys

1.2 Well Diagnostics

PLT and memory PLT logging
Spectral noise and HPT logs
Multi-barrier EM thickness surveys
Multi-arm calipers
Model-based well health checks

1.3 Well Testing

Mobile and fixed multiphase meters
Two-phase and clamp-on meters
BHP build-up and drawdown surveys
PTA and RTA interpretation
Validated test reports with QA/QC

1.4 Well Integrity Management

WIT wellhead integrity tests
SIT string integrity tests
Annulus pressure and MAASP
SSSV function tests
WelliRS records and greasing

1.5 Well Intervention

Torque Action Debris Breaker
Packers and completion tools
Live-well velocity strings
Eclipse non-explosive toolbox
Downhole electrical cutting tool

1.6 Production Optimisation

Gas-lift design and enhancement
Artificial lift selection
Surge Disk perforation clean-up
EOR, inflow control, chemicals

STREAMLINE 01 · P&T · ORIGINAL MAP

Our Operation Services

Every service below links to its technology chapter. Original map, updated to the current portfolio.

Flow Measurements

- Single-phase (clamp-on) flow meter →
- Two-phase flow meter →
- Smart multiphase flowmeter →
- Mobile multiphase flowmeter →

Well Intervention

- Torque Action Debris Breaker →
- Echometer →
- Downhole electrical cutting tool →

Production Enhancement

- Gas-lift enhancement tool (SST) →
- IOR/EOR biocatalyst PSC →
- H_2S scavenger and adsorbent →
- Chemical injection skid →

Well & Asset Integrity

- Bismuth-based alloy technology →
- Enhanced pipe detection tool (EPDT) →
- WIT / SIT integrity testing →

STREAMLINE 01 · PRODUCTION & TECHNOLOGY · SEGMENT 1.1

1.1 Field Surveillance

Rates, pressures and fluid levels gathered without shutting wells in, and read by the engineers who act on them.



Testing services

Clamp-on, Echometer, data integration and continuous monitoring

2 SLIDES →

Downhole gauges

Memory, SRO and wireless gauges; real-time monitoring

1 SLIDE →



Clamp-on flow meter

Transit-time ultrasonic flow from outside the pipe

8 SLIDES →

Overview: Field surveillance → | Surveillance value & cases → | Engineering: Surveillance engineering → | Engineering: Measurement technology →

1.1 · FIELD SURVEILLANCE

Field Surveillance

Surveillance turns well performance from monthly allocation into measured fact: rates, pressures and fluid levels gathered without shutting wells in.

- Allocation reconciled against independent measurement
- Loading, lift and decline problems seen early
- Data trended per well, at the wellsite and in the office

Downhole gauges

Quartz pressure and temperature gauges in memory, surface read-out and wireless configurations.

Real-time monitoring

Downhole and wireless surface sensors feeding one dashboard, with analytics and closed-loop control.

Clamp-on flow surveys

Gas, gas-lift injection, water injection and well flowlines measured from outside the pipe.

Fluid level and BHP

Acoustic surveys read fluid level, dynamometer cards and producing BHP from the wellhead, with no intervention.

1.1 · FIELD SURVEILLANCE

Clamp-On Flow Surveys and Fluid-Level Surveys

Portable clamp-on ultrasonic surveys

Transit-time transducers strapped to the outside of the pipe measure single-phase gas or water with no cutting, no hot work and no shut-in.

APPLICATIONS

Gas-lift injection, line by line
Water-injection header distribution
Gas producers and well flowlines
Validation of suspect permanent meters

Each survey includes a validation day and a QA/QC'd report reconciled against design and allocation rates.

Acoustic fluid-level and dynamometer surveys

The Echometer Well Analyzer reads fluid level, dynamometer cards and pressure together from the wellhead, controlled by its TAM software.

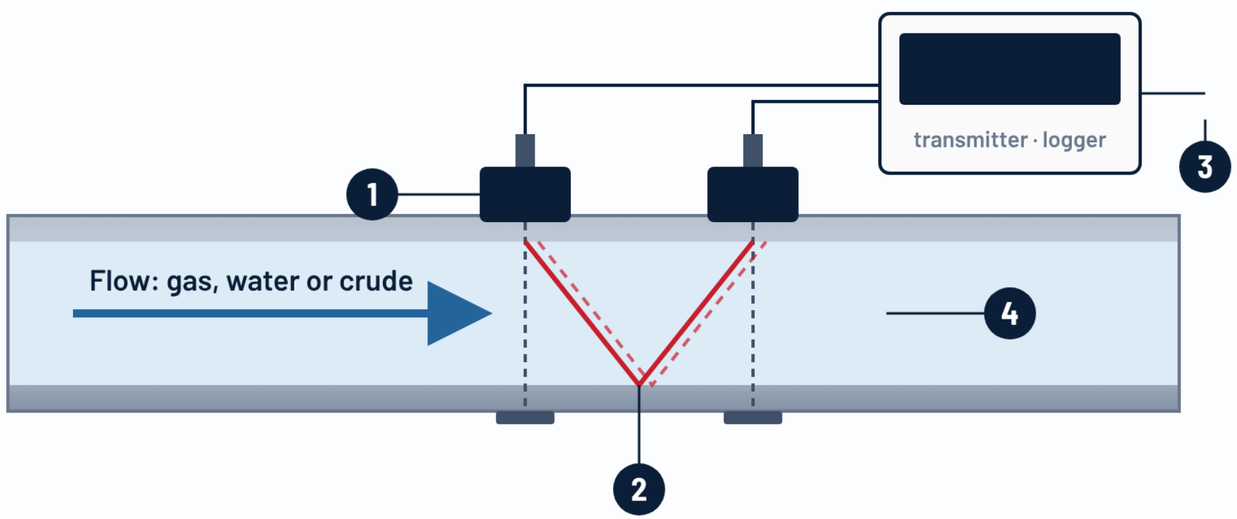
WHAT IT SHOWS

Fluid level above the pump
Producing bottom-hole pressure
Pump fillage and rod loading
Inflow data for lift design

Portable and light: surveys run from surface on producing wells, with no intervention.

1.1 · FIELD SURVEILLANCE

How a Clamp-On Survey Works



1. Transducers strapped on the pipe: no cutting, no hot work, no shut-in
2. Ultrasonic pulses cross the fluid with and against the flow
3. The transmitter turns the transit-time difference into velocity and rate, and logs it
4. Pipe OD, wall thickness and material are entered on site

Each survey includes a validation day and a QA/QC'd report reconciled against design and allocation rates.

1.1 · FIELD SURVEILLANCE · TESTING SERVICES

Streamlines Testing Services

Measurement hardware and the engineers who read it, mobilized as one team.

Ultrasonic clamp-on meters

Advanced, non-invasive flow measurement for accurate, real-time monitoring in oil and gas lines.

Clamp-on flow meter →

Echometer systems

Precision data collection that optimizes production and enhances safety through acoustic monitoring.

Echometer →

Data analysis & integration

Expert collaboration for system integration, troubleshooting and actionable insights that boost throughput and reliability.

Surveillance engineering →

Continuous flow monitoring

Seamless operation and superior process control through uninterrupted, precise fluid monitoring.

Downhole gauges →

1.1 · FIELD SURVEILLANCE · TESTING SERVICES

Engineering Solutions

Production optimization

Enhancing well productivity through precise flow and data analysis for better reservoir management.

Gas-lift monitoring

Ensuring optimal gas injection rates with real-time flow monitoring to improve oil recovery.

Water-injection monitoring

Managing water injection volumes and pressures to maintain reservoir pressure and maximize output.

Production and injection testing operations

- Single-phase measurement →
- Two-phase measurement →
- Multiphase measurement →

Production chemistry & flow assurance

Analyzing chemical interactions to prevent blockages and ensure smooth fluid flow.

1.1 · FIELD SURVEILLANCE

Downhole Gauges and Real-Time Monitoring

Bottom-hole pressure and temperature gauges

Item	Service configuration
Configurations	Memory tandem, surface read-out, wireless
Sensors	Dual quartz pressure and temperature
Ratings	Standard and HPHT, 15,000 and 20,000 psi
Calibration	Every 6 months or 20 runs
Hangers	Bomb hangers for 2⅞", 3½" and 4½" tubing
Ancillaries	Bundle carriers, 24/40/60-arm calipers

Real-time metering, monitoring and control

1. Downhole and wireless surface sensors on oil, gas and injection wells
2. One SCADA dashboard for every well, field and facility
3. Analytics for anomaly detection and trend prediction
4. Closed-loop control of chokes, pumps and injection rates

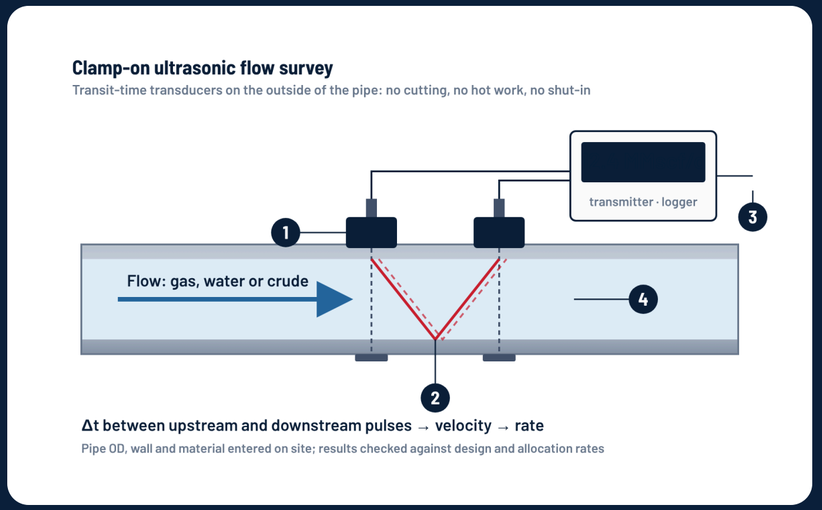
1.1 · FIELD SURVEILLANCE

Single-Phase (Clamp-on) Flow Meter

Transit-time ultrasonic measurement from outside the pipe: no cutting, no welding and no interruption to production.

IN THIS CHAPTER

02 Overview →
03 Transducer arrangement →
04 Transit-time method →
05 From transit time to flow →
06 Benefits →
07 Specifications →
08 Case studies →



Clamp-on survey set-up: transducers on the pipe, ultrasonic path and transmitter

1.1 · SINGLE-PHASE (CLAMP-ON) FLOW METER

Overview

- Ultrasonic clamp-on flowmeters achieve flexible flow measurement without direct contact with the fluid, simply by being “clamped” onto the outside of the pipe.
- They use sound waves to determine the transit time of a gas or liquid.
- Since ultrasound propagates in solids, the transducers can be mounted onto the pipe. The measurement is therefore non-intrusive: no cutting or welding of pipes is required to install the transducers.
- It can accurately monitor any changes in flow, both upstream and downstream.



Portable clamp-on ultrasonic flow meter

1.1 · SINGLE-PHASE (CLAMP-ON) FLOW METER

Transducer Arrangement

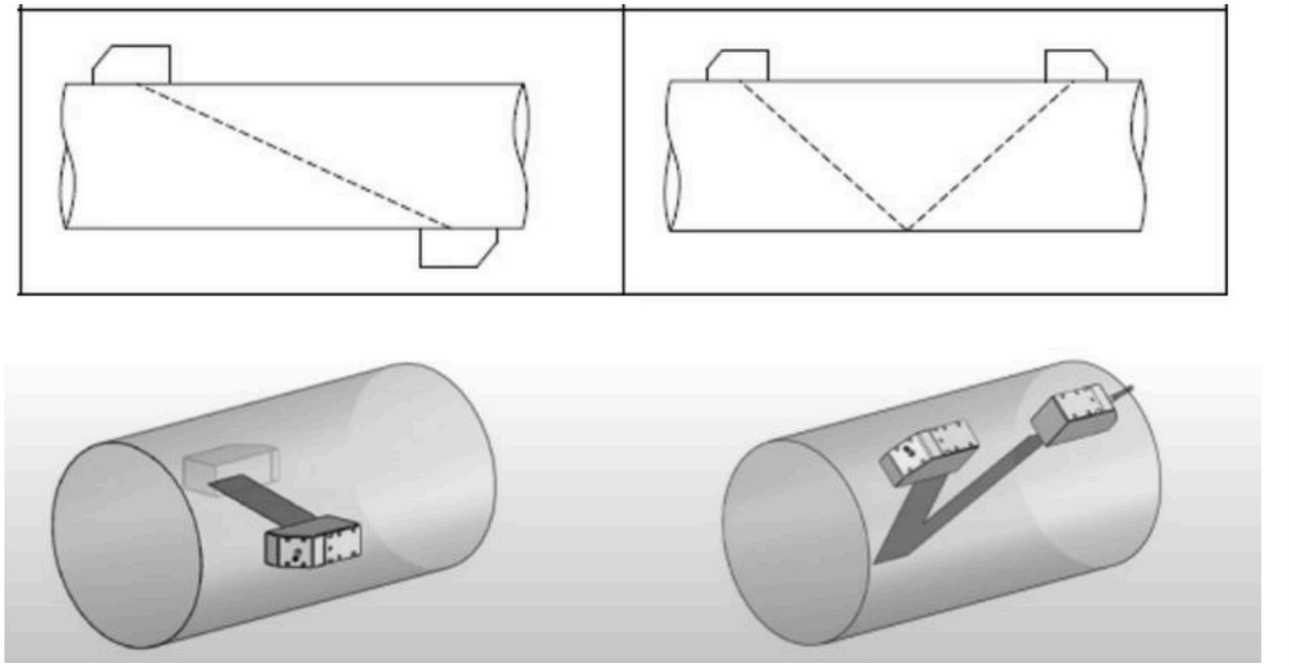
Diagonal arrangement

The transducers are mounted on opposite sides of the pipe.

Reflection arrangement

The transducers are mounted on the same side of the pipe.

Reflection mode doubles the sound path for small pipes or low velocities; diagonal mode suits large pipes and difficult fluids.

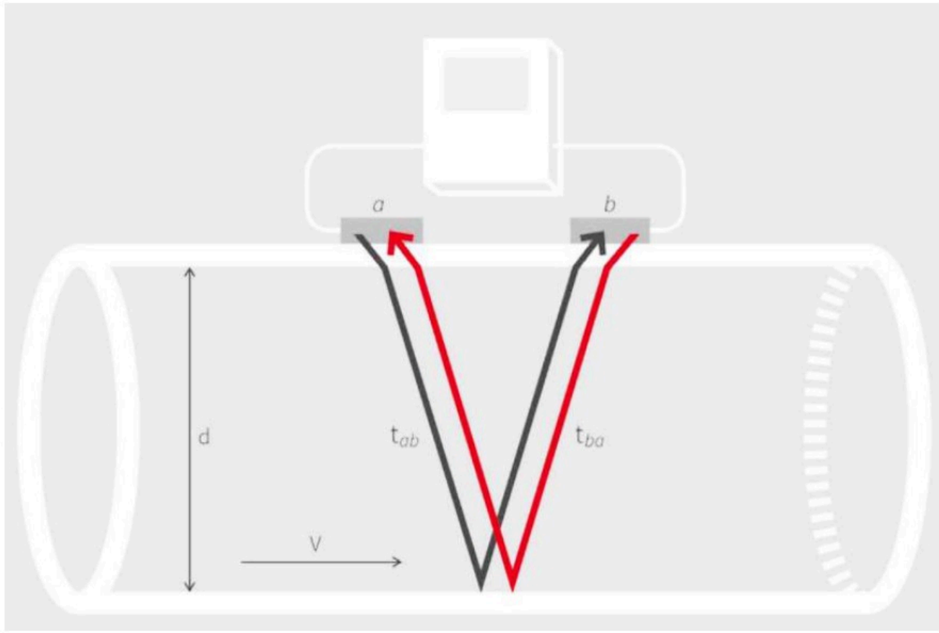


Diagonal (left) and reflection (right) transducer arrangements

1.1 · SINGLE-PHASE (CLAMP-ON) FLOW METER

The Transit-Time Difference Method

- The transit-time difference method exploits the fact that the transmission speed of an ultrasonic signal depends on the flow velocity of the carrier medium.
- Like a swimmer swimming against the current, an ultrasonic signal moves more slowly against the flow direction of the medium than with it.
- For the measurement, two ultrasonic pulses are sent through the medium, one in the flow direction and the second against it. The transducers work alternately as emitter and receiver.



Sound path between the transducers: with and against the flow

1.1 · SINGLE-PHASE (CLAMP-ON) FLOW METER

From Transit Time to Volume Flow

- The transit time of the ultrasonic signal propagating in the flow direction is shorter than that of the signal propagating against the flow direction.
- The transit-time difference can thus be measured, and the average flow velocity determined from the propagation path of the ultrasonic signals.
- An additional profile correction is performed by its algorithms to obtain exceptional accuracy for the average flow velocity over the cross-section of the pipe, which is proportional to the volume flow.

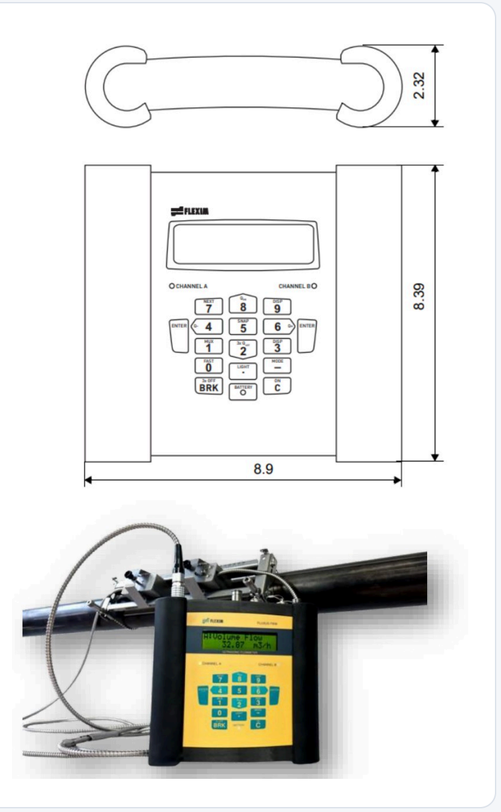


Transmitter and transducers in operation on a line

1.1 · SINGLE-PHASE (CLAMP-ON) FLOW METER

Benefits

- Lightweight, durable, and accurate in any environment.
- Precise, reliable measurements in extreme conditions (high temperatures, varying flow rates, harsh environments) with rugged transducers and auto-calibration.
- Compact, with a long-lasting battery and water-resistant housing: ideal for offshore and mobile operations with minimal set-up.



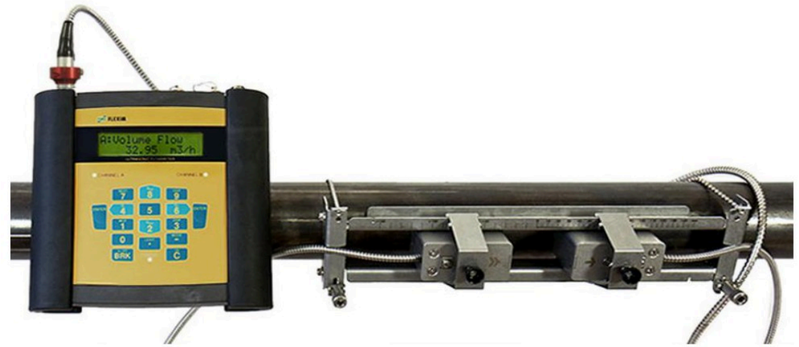
Transmitter dimensions (in) and field set-up

1.1 · SINGLE-PHASE (CLAMP-ON) FLOW METER

Specifications

Measurement	Single-phase
Pipe diameter	0.28 – 63 in
Flow velocity	0.03 – 115 ft/s
Pipe temperature	40 – 392 °F
Measurement uncertainty	±1–2% of MV ±0.02 ft/s
Repeatability	0.15% of MV ±0.02 ft/s
Pressure range	15 psi to unlimited

Measurement with transducers mounted with the portable Variofix VP



Measurement with the flow transmitter fixed to the pipe with the QuickFix pipe mounting fixture

1.1 · SINGLE-PHASE (CLAMP-ON) FLOW METER

Case Studies

EGYPT AND THE GULF

Dubai Petroleum Company

Used successfully for over five years with high-accuracy measurement.

GUPCO

Implemented for accurate gas-flow measurement; offshore operations use portable FLEXIM ultrasonic meters for gas-lift and water-injection rate monitoring.

Khalda Petroleum Company

Clamp-on ultrasonic meters give rapid, non-intrusive monitoring of water-injection wells at onshore facilities, run by the Khalda operations team.

INTERNATIONAL REFERENCES

Statoil · water-injection monitoring

Injection volumes were gauged with differential-pressure meters prone to abrasion and deposits. Clamp-on meters were installed with no pipe cutting or downtime, improving reliability and cutting maintenance.

ROC Oil · C9 platform

A portable FLUXUS ADM 6725 verified the turbine meters on the water-injection lines: on DN150 pipes, readings matched within 0.3%.

1.1 · FIELD SURVEILLANCE · BUSINESS CASE

Surveillance and Gas-Lift Measurement: Value and Cases

WHY IT PAYS

- Lift-gas meters in mature fields read low: ADNOC found field meters under-reading by **75–124%** in all ten surveyed wells (SPE-208003-MS).
- Accurate per-well injection data is worth about 10% of liquids, around **US$200,000 per well per year** (Shell, Badan field, SPE-193413-MS).
- Gulf of Suez benchmark: **535–556 bbl of oil per MMscf** of lift gas, so freed gas revives shut-in wells (GUPCO, OGJ 1996).

EGYPT, SAME COMPRESSORS

GUPCO Ramadan: +2,024 bopd across 19 wells by reallocating lift gas. GUPCO Field A: +510 bopd and 5.5 MMscfd of HP gas freed at the same compressor capacity.

CASE HISTORIES · EGYPT FIRST

Where · when	What was done	Published result	Source
Egypt · Ramadan field, GUPCO · 1996	Gas-lift optimisation of 19 wells: per-well performance curves, injection depth and gas reallocation	**+2,024 bopd achieved (projected +2,115); 535 → 556 bbl per MMscf injected**	OGJ, Abdel-Waly et al.
Egypt · offshore Field A, GUPCO · 2014	Integrated PROSPER/GAP network model; gas reallocated and saved gas sent to three shut-in wells	**+510 bopd in total; ~5.5 MMscfd HP gas saved**	OTC-24703-MS
Nigeria · Badan field, Shell · 2018	Portable clamp-on ultrasonic gas meter on lift-gas lines for optimisation and testing	**±10% liquids per well ≈ US$200k/well/yr; lift gas reduced**	SPE-193413-MS

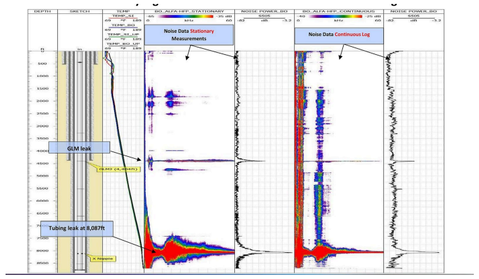
No published Egyptian clamp-on case; the Egyptian evidence is for gas-lift optimisation, which these surveys feed.

Sources: OGJ 24 Jun 1996; OTC-24703-MS; SPE-208003-MS; SPE-193413-MS

STREAMLINE 01 · PRODUCTION & TECHNOLOGY · SEGMENT 1.2

1.2 Well Diagnostics

The problem found before the completion is pulled: leaks, flow behind pipe and metal loss located from inside the well.



Noise & temperature logging

Leaks and flow behind pipe, located by depth

1 SLIDE →



EPDT

Metal loss on up to five pipes, tubing in place

12 SLIDES →



Echometer

Fluid level, dynamometer and pressure from the wellhead

1 SLIDE →

Overview: The question each tool answers →
Diagnostics value & cases →
Engineering: PLT and log interpretation →
Engineering: Well integrity engineering →
Engineering: Lift health check →

1.2 · WELL DIAGNOSTICS

Well Diagnostics: the Question Each Tool Answers

Diagnostic	What it answers	Deployment
PLT and memory PLT	Zonal oil, gas and water contribution	E-line or slickline
Spectral noise and HPT	Leaks and flow behind pipe, by depth	E-line or memory
Multi-barrier EM	Metal loss on up to five pipes, tubing in place	E-line, slickline, CT
Multi-arm calipers	Internal tubing and casing condition	Slickline or e-line
Echometer dynamometer	Fluid level, BHP, pump and valve condition	From surface
Model-based health check	Inflow and outflow mismatch, lift efficiency	Desk study

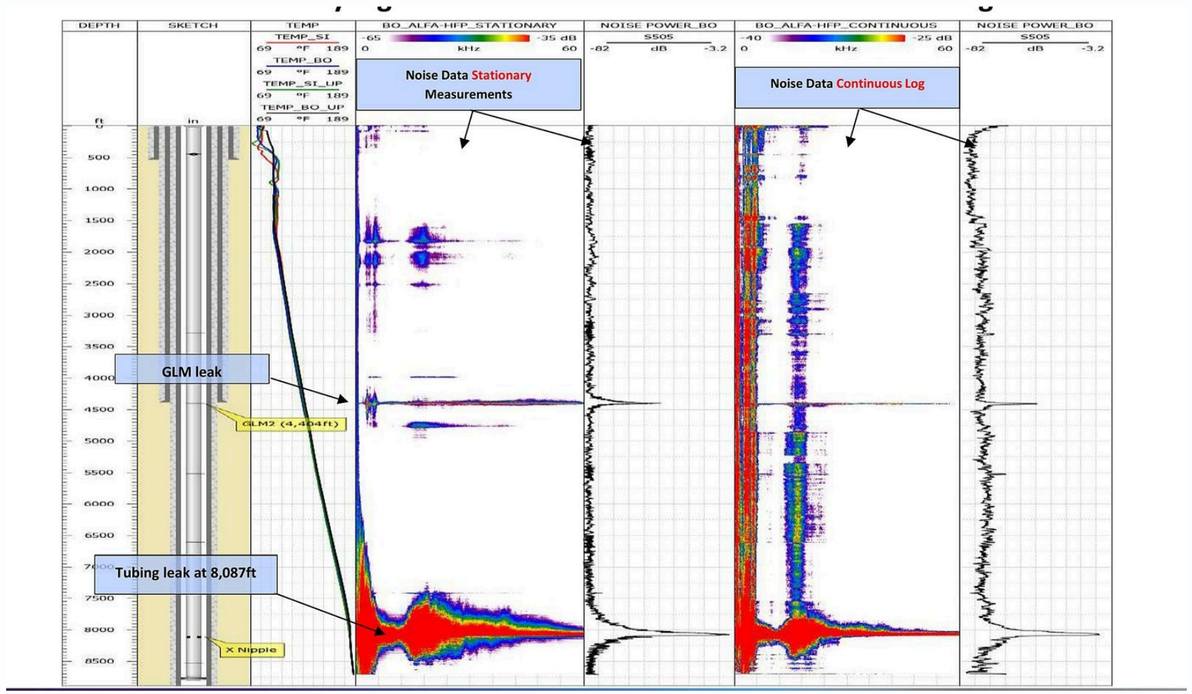
Every job closes with our engineers' interpretation and an action list, not a log print.

1.2 · WELL DIAGNOSTICS

Leak Detection and Barrier Diagnostics

Flow through a leak, a channel or a perforation has an acoustic signature by frequency and depth. Spectral noise logging, paired with high-precision temperature and EM thickness, locates the failed barrier before anyone pulls the completion.

- Tubing, casing, mandrel and packer leaks
- Behind-casing crossflow and channelling
- Source of sustained annulus pressure
- Mandrel leaks told apart from valve flow



Representative spectral noise log: gas-lift mandrel leak and tubing leak located by depth.

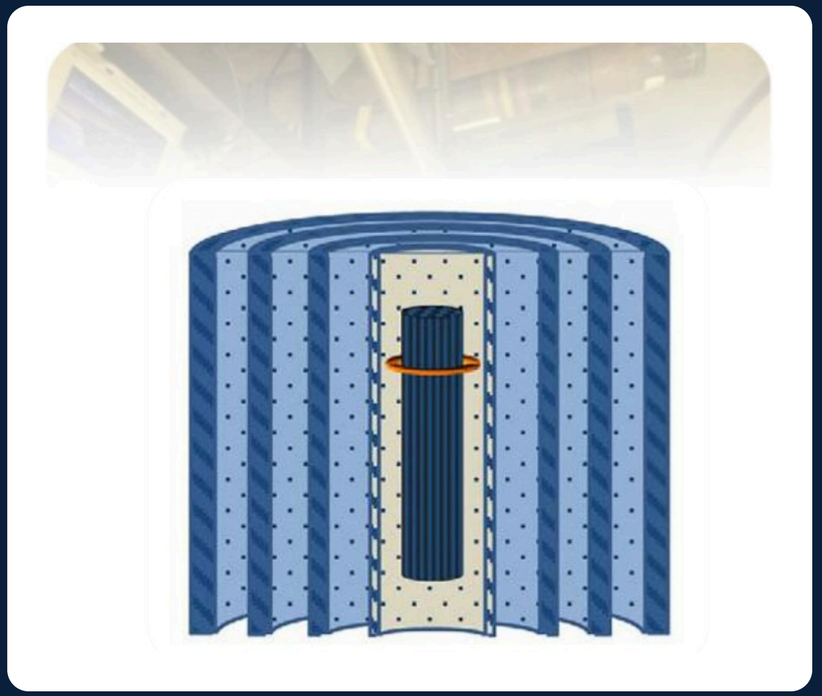
1.2 · WELL DIAGNOSTICS

Enhanced Pipe Detection Tool (EPDT)

Electromagnetic inspection of up to five concentric pipes in one run, with the tubing left in place.

IN THIS CHAPTER

02 Introduction →
03 Components →
04 Logging system →
05 Principle →
06 Transient decay →
07 Pipe detection →
08 Data output →
09 Case 1 →
10 Case 2 →
11 Benefits →
12 Specifications →



Transmitter and receiver coils inside the pipe strings

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

Introduction

Electromagnetic based

Sends short electromagnetic pulses

↓

Reads how the metal responds

Function

Measures the metal wall thickness

Multiple-pipe corrosion inspection

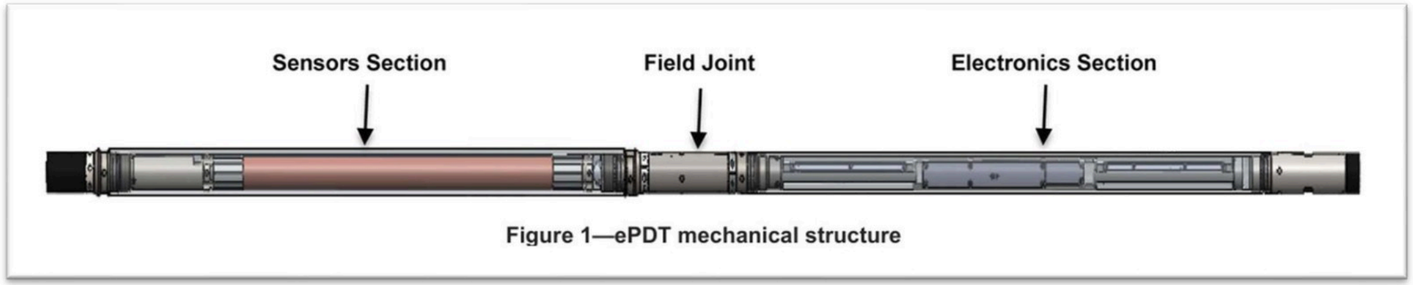


EPDT coils and pipe samples in the test bay

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

Tool Overview: Components

COMPONENT	FUNCTION
Sensor section	TX coil and RX coil
Field joint	Joins the sensor and electronics sections
Electronics section	Power supply, data acquisition and tool control



EPDT mechanical structure: sensor section, field joint, electronics section

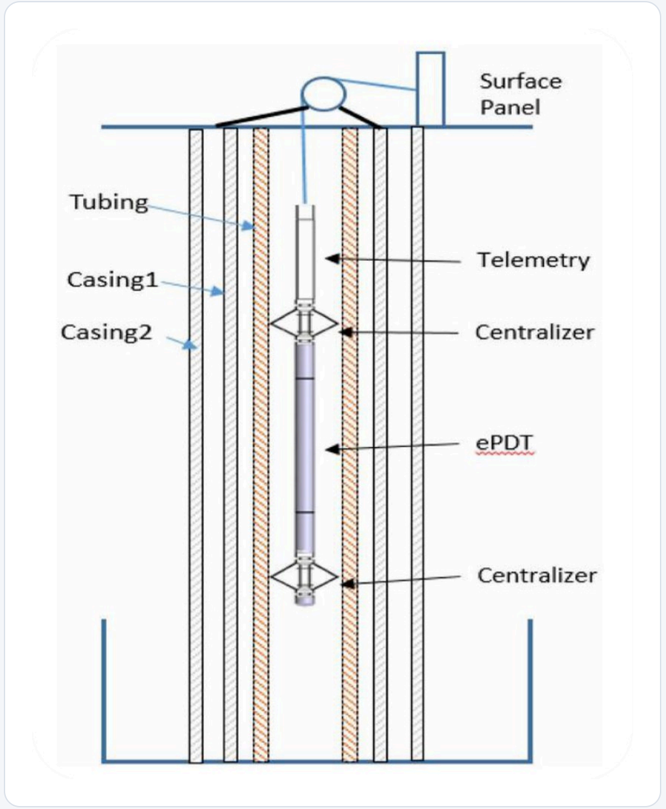
1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

Tool Overview: Complete Logging System

COMPLETE LOGGING SYSTEM

- Surface panel
- Downhole telemetry or power module
- Centralizers, roller stem or tractor
  - Selected on well deviation

Runs on e-line, slickline or coiled tubing, so the conveyance matches the well rather than the other way round.

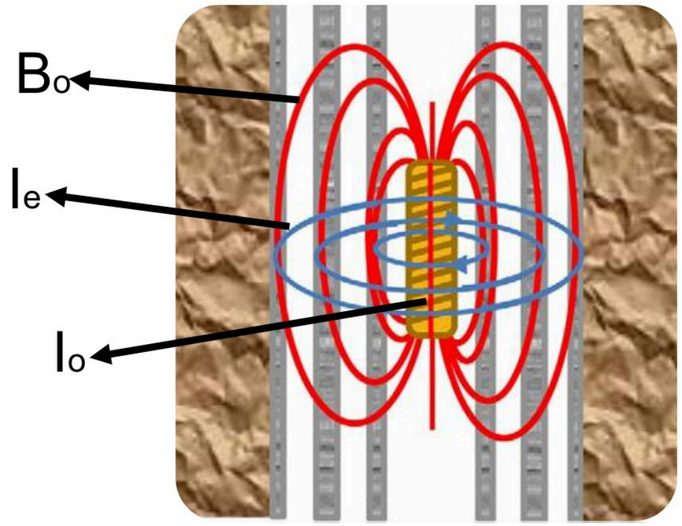


Logging string inside tubing and two casings

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

How It Works: Principle

1. Generate electric current I_o
2. Primary magnetic field B_o
3. Stabilization of B_o
4. Turn off the electric current I_o
5. Primary magnetic field decays
6. Induced eddy current I_e
7. Secondary magnetic field generated
8. Receivers measure the response



Primary field B_o, eddy current I_e and source current I_o

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

How It Works: Transient Decay

The measured signal is transient and decays with time.

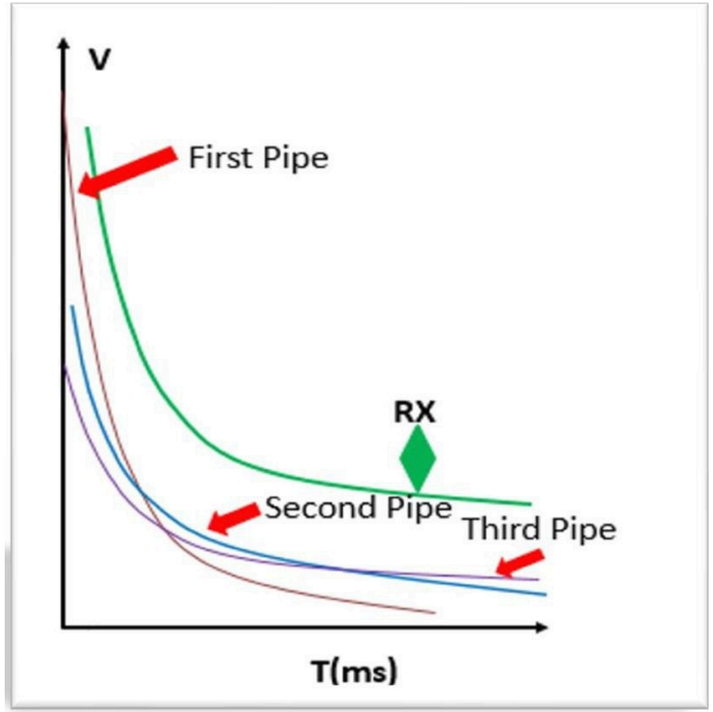
The shape and speed of the transient decay depend on:

- Pipe conductivity
- Magnetic permeability
- Geometry, including wall thickness

Analyse the decay

↓

Quantify the wall thickness



Transient decay from the first, second and third pipe

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

How It Works: Which Pipes Are Detected

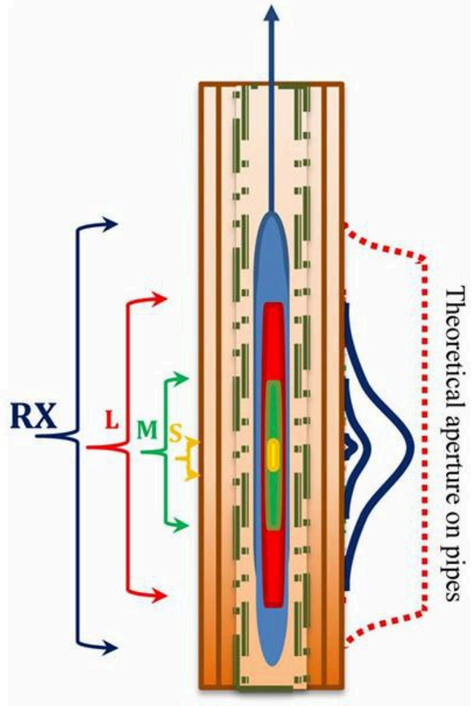
PIPES DETECTED DEPEND ON

Size of the transmitter (Tx)

- Small Tx detects the inner pipes
- Medium Tx detects the medium pipes
- Large Tx detects the large pipes

Distance between Tx and receiver (Rx)

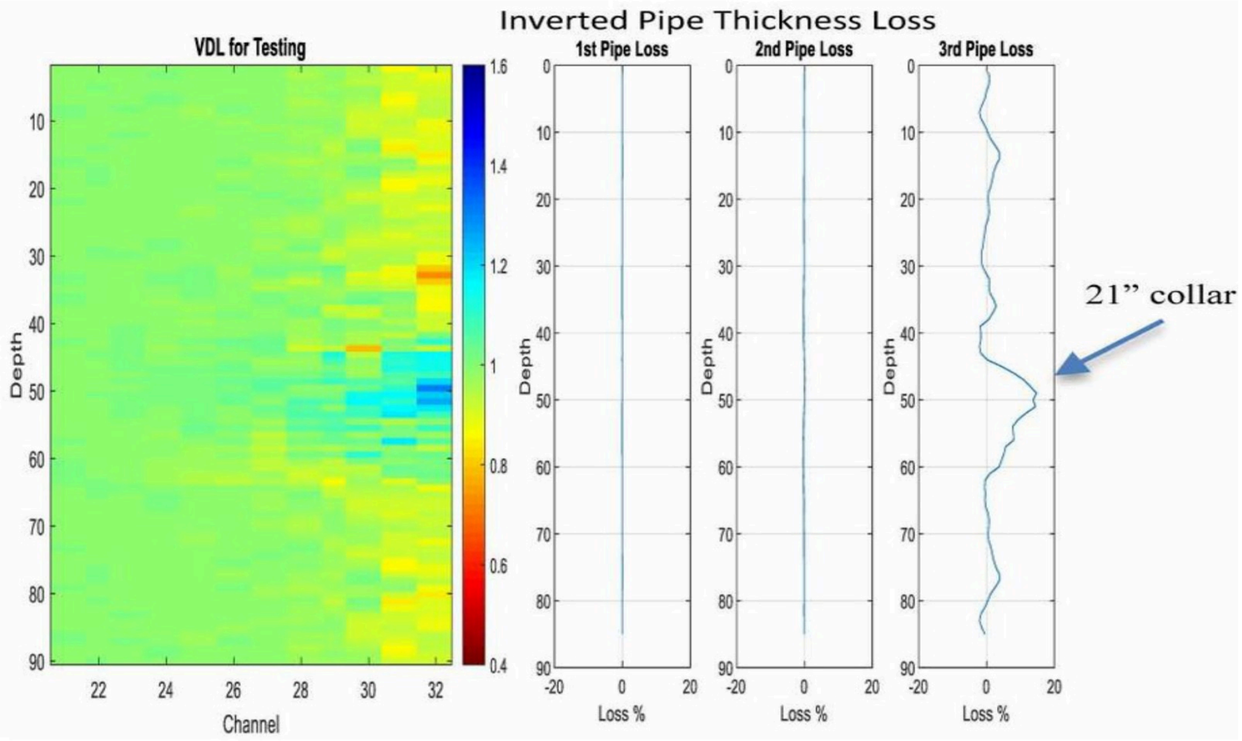
- Tx near the Rx: more sensitive to the inner pipe
- Tx far from the Rx: the signal penetrates deeper



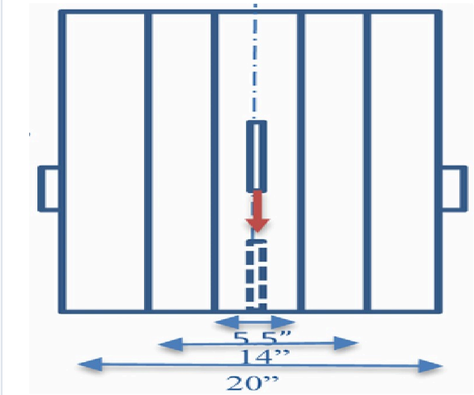
Short (S), medium (M) and long (L) spacings and their aperture on the pipes

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

Data Output



VDL for testing and inverted pipe-thickness loss for the first, second and third pipe



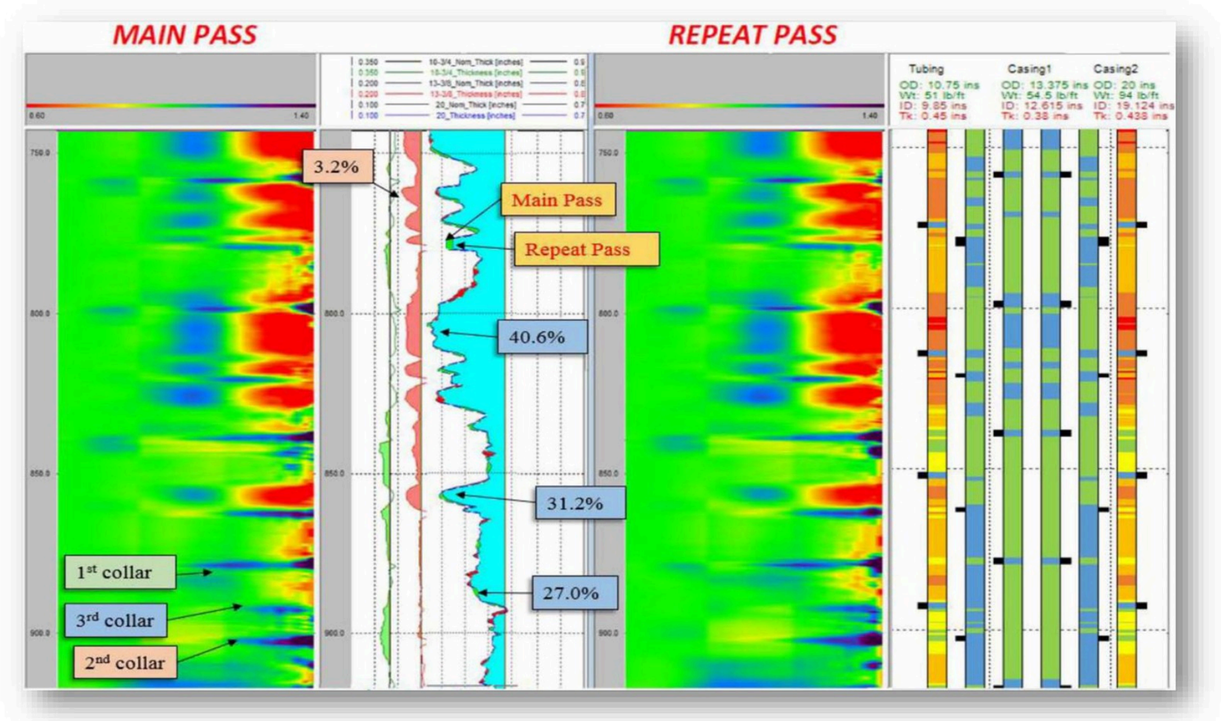
Collar position across the strings

READING THE LOG

A collar is clearly visible on the VDL and shows as a 20% increase in calculated thickness.

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

Data Output: Case 1



Main and repeat passes with collars and metal-loss readings

CASE 1

Severe damage is indicated on the third pipe in several localized areas over a 125 ft interval; metal loss ranges from 27% to 0%.

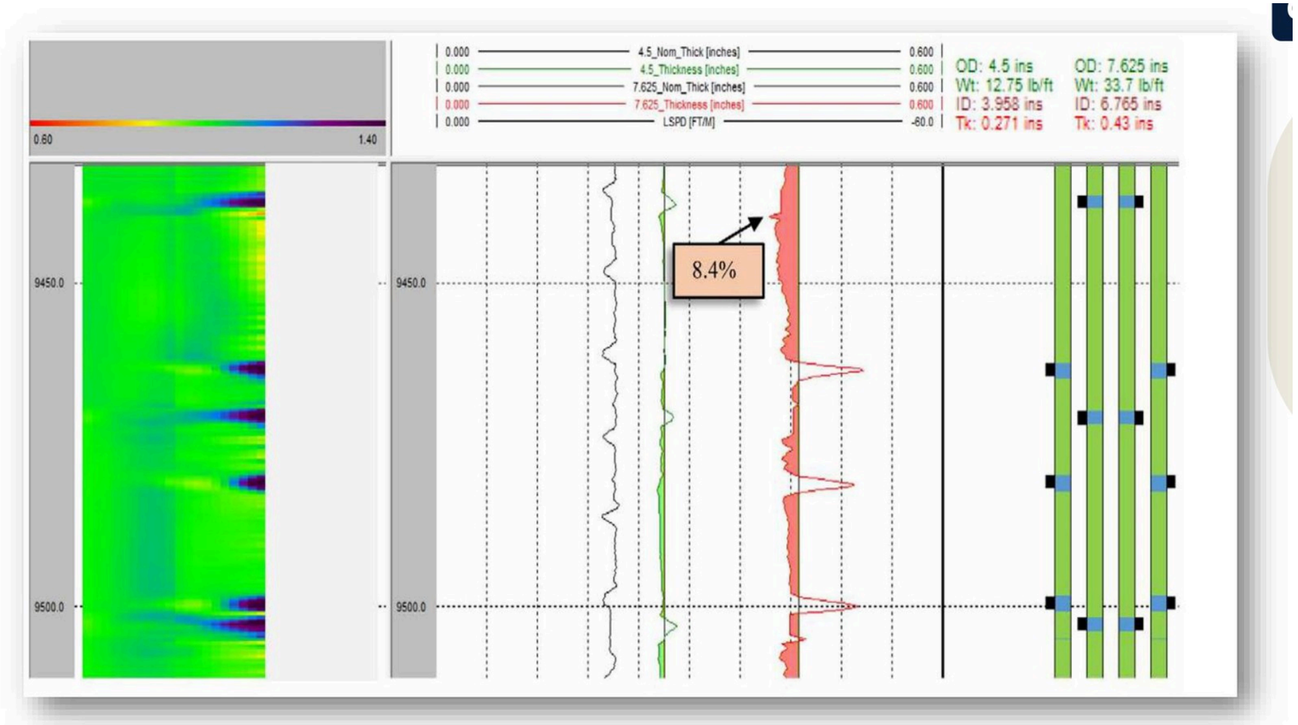
2% variance between passes

↓

Logging-motion noise

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

Case Study: Case 2



Log with VDL, thickness curves and the 8.4% outer-pipe corrosion

CASE 2

The VDL shows high-integrity log data and excellent signal-to-noise ratio. The 8.4% corrosion on the outer pipe is picked up from this log.

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

Benefits

Checks many pipes at once

Up to 5 layers

No need to pull tubing

Saving time, cost and risk

Works in many conditions

Even if the pipe is coated, corroded or covered with scale

Real-time feedback

Viewed live while running, so problems are spotted immediately

Slim tool, fits small spaces

Around 2 in OD

Detects collars, shoes and anomalies

Locates joints and unusual spots, not only thickness

Safer well decisions

Repair, abandon or keep producing, decided without guesswork

Higher logging speed

More footage per day on the same job

1.2 · ENHANCED PIPE DETECTION TOOL (EPDT)

Typical Specifications

Tool OD	~2 in
Length	~3–4 m
Max pipes measurable	Up to 5 concentric pipes
Pipe OD range	2-7/8 in (smallest) to 26 in (largest)
Depth resolution	Collar detection within ~0.1–0.2 m
Operating temperature	~350 °F (175 °C)
Operating pressure	~20,000 psi (138 MPa)
Well intervention	E-line, slickline or coiled tubing

WELL DEVIATION	CONVEYANCE
Below 60°	Wireline
60° to 70°	Roller stem
Above 70°	Coiled tubing
Horizontal	Tractor

1.2 · WELL DIAGNOSTICS · FLUID LEVEL AND DYNAMOMETER

Echometer Well Analyzer

Applications

- The Echometer Well Analyzer is an integrated system for the acquisition and diagnosis of data in artificial-lift surveys.
- It allows the operator to maximize oil and gas production with a minimum of operating expense.

Advantages

- Simultaneous acquisition of fluid levels, dynamometer data and pressure recording, controlled by the TAM software and the computer.
- Easy to handle, portable and lightweight, making data acquisition much simpler.
- Easier navigation, faster installation and optimized analysis options.



Echometer survey at the wellhead

1.2 · WELL DIAGNOSTICS · BUSINESS CASE

Diagnostics: Value and Cases

WHY IT PAYS

- Spectral noise detects leaks as small as **9.7 ml/min**, high-precision temperature from ~6 l/h, both through tubing and behind several barriers (SPE-190888-MS).
- Diagnosis first turns a blind workover into a targeted one: leak depth and path are defined before anyone mobilises (TGT CS025, India).
- Time-lapse pressure-transient analysis separates **skin damage from water invasion**, so stimulation money is not spent on a water problem (WDDM, SPE-164668-MS).
- Sustained annulus pressure affects **10–30% of mature-field wells** in published surveys, so screening pays (Schulz et al., 2025).

FIND THE WATER FIRST

A Gulf of Suez rigless shut-off and re-perforation, built on diagnosis of the rising OWC, added ~4,000 bopd at zero water cut and came in US$100,000 under the original plan (Halliburton, 2017).

CASE HISTORIES · EGYPT FIRST

Where · when	What was done	Published result	Source
Egypt · WDDM, Nile Delta (BG) · 2013	Time-lapse PTA on permanent downhole gauge data across groups of control wells	**Rising skin identified as the main cause of productivity loss in low-liquid producers; intervention choice guided**	SPE-164668-MS
Egypt · Gulf of Suez offshore · 2017	Diagnosis of OWC rise, through-tubing bridge plugs, eleven new intervals perforated, no rig	**+~4,000 bopd (≈5% of field oil), zero water cut, US$100k saved vs plan**	Halliburton case
UAE · ADCO · 2012	HPT and spectral noise logging for sustained pressure in the B and C annuli	**Two integrity failures located behind multiple barriers where conventional logs failed**	SPE-161983-MS
UK · Premier Oil, subsea · 2018	EM thickness plus SNL/HPT through tubing to set envelope test values before P&A	**16% metal loss located in 9⅝" casing; rig-based tubing retrieval avoided**	SPE-190888-MS

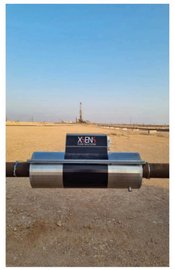
No published Egyptian spectral-noise or EM-thickness case; the regional cases are from Abu Dhabi and the North Sea.

Sources: SPE-164668-MS; Halliburton (Egypt, 2017); SPE-161983-MS; SPE-190888-MS; TGT CS025; Schulz et al., J Pet Explor Prod Technol 2025

STREAMLINE 01 · PRODUCTION & TECHNOLOGY · SEGMENT 1.3

1.3 Well Testing

Rates and pressures you can defend: meters at the wellhead, gauges downhole, and interpretation by our engineers.



Two-phase flow meter

Oil–water rate and water cut, clamp-on

4 SLIDES →



Smart MPFM

Float-and-oscillation multiphase meter

3 SLIDES →



Mobile MPFM

Dual-separator weighing skid, mobile or fixed

3 SLIDES →

Overview: Well testing → | Testing value & cases → | Engineering: Test and metering campaigns → | Engineering: Testing services →

1.3 · WELL TESTING

Well Testing

Multiphase metering

Venturi with single and dual gamma detection reads oil, gas and water rates in real time, with no test separator.

1.5" to 16" line sizes
Truck-mounted or fixed
Gas-lift and ESP tuning sessions
New-well clean-up and evaluation

Pressure surveys

Build-up, drawdown, static and flowing gradient surveys with dual quartz gauges, memory or surface read-out.

Standard and HPHT gauges
Gauge calibration every 6 months
Bomb hangers and bundle carriers
Echometer surveys on pumping wells

Design and interpretation

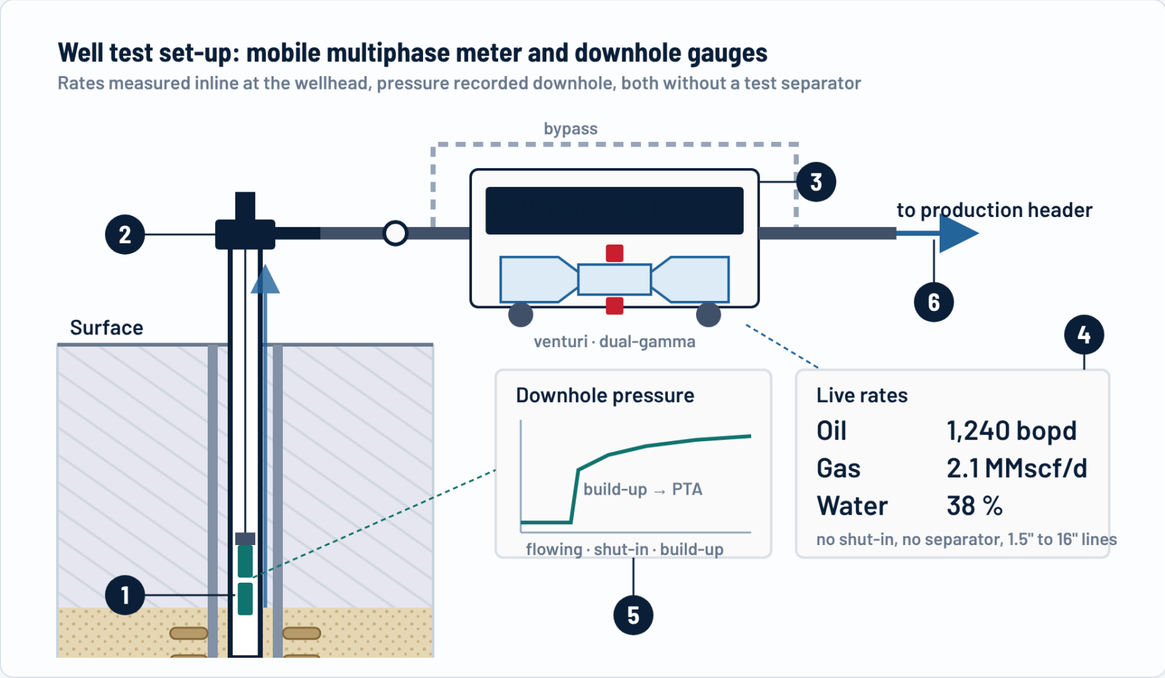
Our engineers design the test, interpret it and turn it into decisions for the reservoir and the well.

Pressure-transient analysis (PTA)
Rate-transient analysis (RTA)
Well-model calibration
Validated, QA/QC'd reports

COMMERCIAL ROUTES Campaign service with our crews · rental with operator support · purchase with commissioning and training

1.3 · WELL TESTING

Well Test Set-Up: Meter at the Wellhead, Gauges Downhole



The multiphase meter is tied in on the flowline with a bypass, so the well keeps producing to the header while oil, gas and water rates are read live. Dual quartz gauges hang near the perforations and record the flowing and shut-in pressures the transient analysis needs.

1 Dual quartz gauges on a bomb hanger: memory or surface read-out
2 Wellhead and flowline unchanged; no hot work
3 Mobile multiphase meter: venturi with dual-gamma detection
4 Live oil, gas and water rates; 1.5" to 16" lines
5 Flowing, shut-in and build-up pressure for PTA and RTA
6 Production returns to the header; no test separator

WHAT YOU GET

Verified rates for allocation, a calibrated well model, and reservoir parameters from the build-up: permeability, skin and boundaries, in a QA/QC'd report.

1.3 · WELL TESTING

Two-Phase Flow Meter

Clamp-on oil–water flow and water-cut measurement in one device, installed in hours with no pressure drop.

IN THIS CHAPTER

02 Overview →
03 Specifications →
04 Case studies →

±1%
of flow, across 0–100% water cut

1:400
turndown: 0.1 to 40 m/s

2–3 h
clamp-on installation, no pressure drop

1.3 · TWO-PHASE FLOW METER

Overview

- **2-in-1 design:** measures oil–water flow rate and water cut (0–100%) with 1% accuracy.
- **Clamp-on installation:** easy set-up (2–3 hours) with no pressure drop.
- No need for static mixers or flow straighteners.
- **Integrated flow computer:** outputs water cut, net oil and net water flow rates.
- **High turndown ratio (1:400):** handles fluid velocities from 0.1 to 40 m/s.

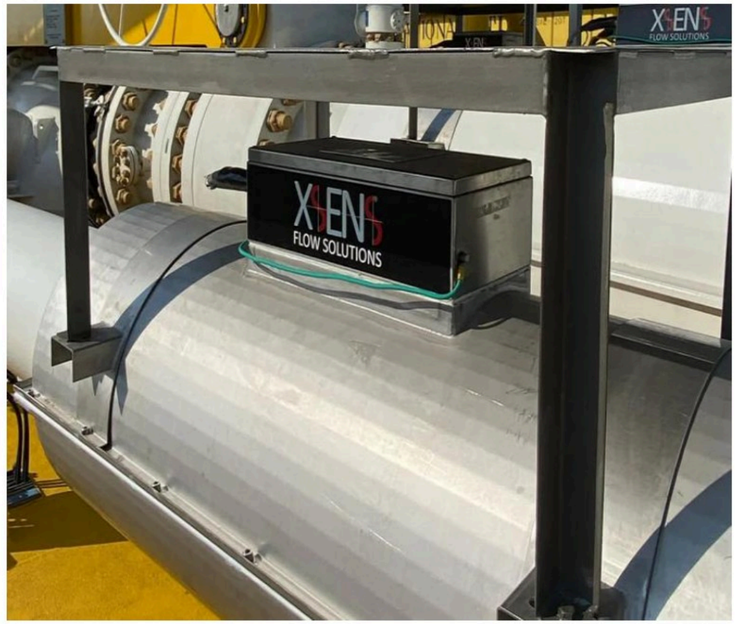


Two-phase meter on a desert flowline

1.3 · TWO-PHASE FLOW METER

Specifications

Fluid compatibility	Hydrocarbon, water and liquid mixtures
Accuracy	±1% of flow (add ±0.01 m/s)
Line size	1.5 in to 36 in and higher
Design pressure	No limit
Corrosive / erosive fluids	Handles both, thanks to the clamp-on design
Design temperature	–20 °C to 100 °C (higher options available)
Flow-rate range	0.1 to 40 m/s
Hazardous-area protection	ATEX, IECEx Zone 1 and 2
Length	1.5 in to 30 in standard (custom sizes available)
Weight	25 kg to 150 kg, depending on size



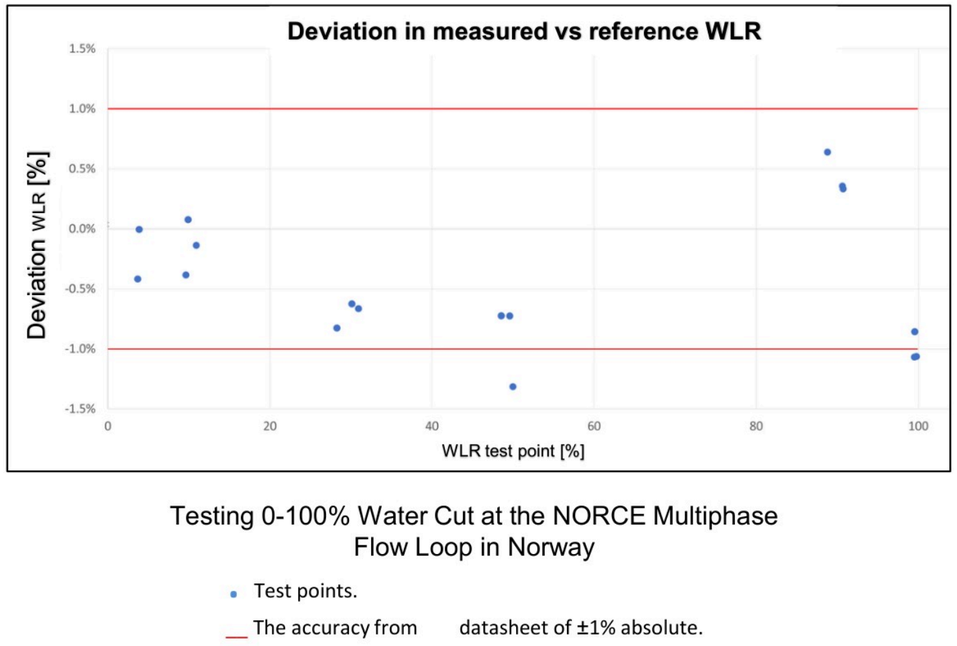
1.3 · TWO-PHASE FLOW METER

Case Studies

- Testing 0–100% water cut at the NORCE multiphase flow loop in Norway.
- Offshore test with a UK North Sea operator.
- Field testing and verification with Petroleum Development Oman.

RESULT

All of these case studies resulted in a flow accuracy of ±1% of flow.



Deviation in measured versus reference WLR across 0–100% water cut (NORCE flow loop)

1.3 · WELL TESTING

Smart Multiphase Flowmeter

Oil, gas and water measured with a float-and-oscillation principle, with pressure and temperature on board.

IN THIS CHAPTER

02 Overview →

03 How it works →

0–5,032
bbl/day flow measurement range

±5% / ±10%
liquid / gas flow accuracy

3,626 psi
upper pressure range

1.3 · SMART MULTIPHASE FLOWMETER

Overview

Measurement medium	Multiphase fluid of oil, gas and water
Measurement parameters	Liquid volume, gas volume, pressure, temperature
Flow measurement range	0 – 5,032 bbl/day
Pressure measurement range	Low: 0 – 363 psi; high: 363 – 3,626 psi
Temperature range	50 °F – 302 °F
Accuracy	Liquid flow ±5%; gas flow ±10%

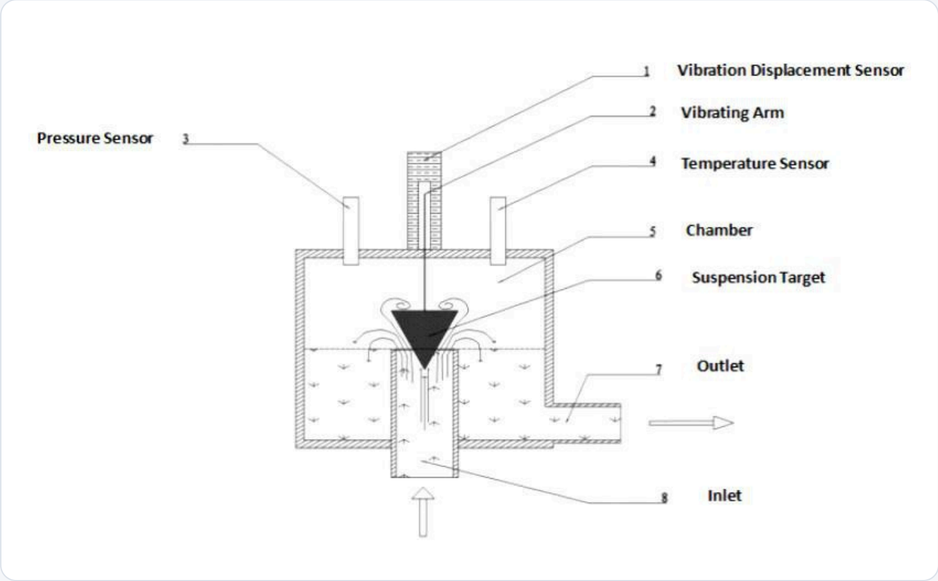


Smart MPFM with solar-powered RTU

1.3 · SMART MULTIPHASE FLOWMETER

How It Works

- **Fluid flow and float mechanism:** gas–liquid flows upward, pushing the float to rise as fluid enters the annulus.
- **Balancing forces:** the interaction between float motion and gravity creates equilibrium.
- **Flow-rate determination:** higher float position = larger throttle area = higher flow rate.
- **Pressure-based measurement:** pressure difference and float displacement determine fluid flow.
- **Measurement formulas:** liquid volume Q = f(h, p, T); gas volume Q = g(h, f, p, T), where h is float amplitude, f oscillation, p pressure and T temperature.



Sensors, vibrating arm, chamber and suspension target

1.3 · WELL TESTING

Mobile Multiphase Flowmeter

A skid-mounted dual-separator weighing meter for continuous gas–liquid measurement, mobile or fixed.

IN THIS CHAPTER

02 Overview →

03 Specifications →

0–9,435
bbl/day fluid range

0–5
MMscf/day gas range

±3% / ±5%
liquid / gas accuracy; water cut ±2%

1.3 · MOBILE MULTIPHASE FLOWMETER

Overview

- A dual-separator weighing metering device measures the gas–liquid production, temperature and pressure of the well continuously through the alternate operation of the two separators.
- The device adopts an integrated skid-mounted structure, which can be used for mobile or fixed installation.
- It suits thin oil measurement, and also foamed crude oil and some heavy oils.
- The metering device can be equipped with a remote terminal unit (RTU) and other equipment for remote data transmission and monitoring.



Skid-mounted dual-separator weighing meter

1.3 · MOBILE MULTIPHASE FLOWMETER

Specifications

PARAMETER	VALUE
Measuring range	Water cut 0–100%; gas 0–5 MMscf/day; fluid 0–9,435 bbl/day
Nominal pressure	360 psi, 580 psi
Measurement accuracy	Liquid flow ±3.0%; gas flow ±5.0%; water cut ±2.0%
Working temperature	41 °F – 176 °F
Explosion-proof class	Exd II BT4
Signal output	Remote data transmission

The same skid serves as a mobile test unit between wells or as a fixed meter on a station.

1.3 · WELL TESTING · BUSINESS CASE

Well Testing: Value and Cases

WHY IT PAYS

- A test separator costs **US$0.8–1.5 million** against US$0.1–0.25 million for a multiphase meter; test flowlines add US$200–400k per km onshore (Shell, NSFMW 2002).
- Measurement bias is money: a +2% water-cut bias on a 500 m^3/d well is ≈ **US$380,000 a year** of mis-allocated revenue (Shell, NSFMW 2002).
- Modern mobile meters hold oil and gas within **±3–5%** of a separator, with 50% lower capex and up to US$550k saved per pad (SLB cases, 2024–25).
- Continuous rate data exposes gas-lift instability a separator cannot resolve: **+650 b/d** after re-tuning one platform well (Hart Energy).

EGYPT PRECEDENT

GUPCO tested seven gas-lifted October-field platform wells at 93–98% gas volume fraction with a multiphase meter in series with the separator: gas and liquid within ±10% at 93–96% GVF.

CASE HISTORIES · EGYPT FIRST

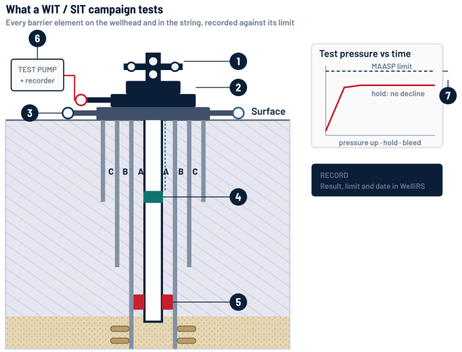
Where · when	What was done	Published result	Source
Egypt · October field, GUPCO · 1998	Non-intrusive MPFM in series with a test separator on seven gas-lifted wells, slugging to annular flow	**Gas and liquid within ±10% of the separator at GVF 93–96%; liquid 1,300–4,700 B/D**	Leggett et al., 1998
Egypt · Western Desert, GUPCO · 2009	Real-time production monitoring with pressure-transient data in a fractured carbonate with active water drive	**Well production doubled inside the coning and erosion limits defined from the data**	SPE-119361-MS
Middle East · auto-gas-lift field · 2015	Vx Spectra multirate testing across ICV settings with back-allocation to two reservoirs	**Field production +40%; pipeline network and about two years of construction avoided**	SLB case study
Canada · Torxen, Alberta · 2025	Vx Spectra replacing test separators: 59 tests on seven wells under a regulator exemption	**Oil within ±3% of separator; up to US$550,000 capex saved per new pad**	SLB case study

Sources: OSTI 580831 (Leggett, Borling, Powers 1998); SPE-119361-MS; Scheers, Shell, NSFMW 2002; SLB case studies 2015/2025; Hart Energy

STREAMLINE 01 · PRODUCTION & TECHNOLOGY · SEGMENT 1.4

1.4 Well Integrity Management

Wells operated inside proven limits: tested barriers, managed annuli and records that survive staff changes.



WIT / SIT testing

Wellhead and string integrity campaigns

3 SLIDES →



Bismuth alloy

Gas-tight metal-to-metal barriers in minutes

5 SLIDES →

Overview: Well integrity management → | Integrity value & cases → | Engineering: Well integrity engineering → | Engineering: EPDT multi-pipe inspection →

1.4 · WELL INTEGRITY MANAGEMENT

Well Integrity: Five Elements, One Service

WIT

Wellhead integrity test

Tree valves, hanger and spool seals, annulus outlets, connections, lockdown screws.

SIT

String integrity test

Tubing, packer, SCSSV and control line, tubing-to-annulus communication.

MAASP

Annulus management

Annulus pressure surveys, bleed-down and build-up, MAASP derivation and limits.

LEAK

Leak-detection diagnostics

Noise and temperature logs, EM corrosion surveys: diagnosis as a core step.

DATA

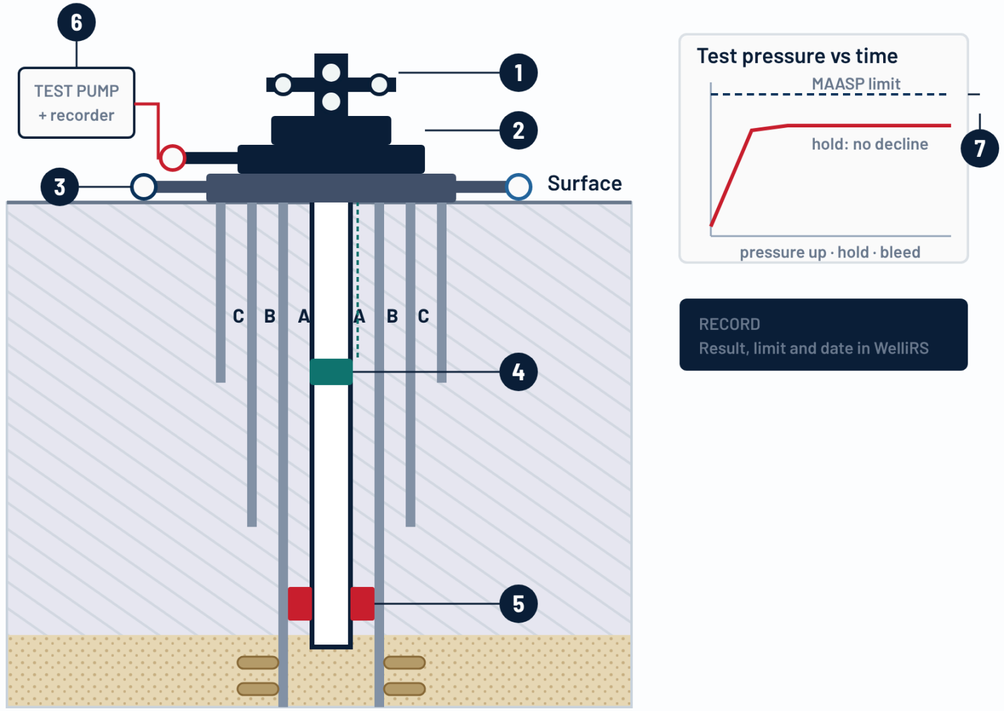
Software, records, expertise

WelliRS barrier register, test programmes and a resident wellhead specialist.

Aim: wells operated inside proven limits, with planned and unplanned deferral reduced. Framed to ISO 16530 and API RP 90.

1.4 · WELL INTEGRITY MANAGEMENT

What a WIT / SIT Campaign Tests



One crew, one programme: every barrier element on the wellhead and in the string is pressure-tested or function-tested, and each result is recorded against its limit.

1 Tree valves and seals: master, wing, swab **WIT**
2 Tubing hanger, spool seals and lockdown screws **WIT**
3 Annulus outlets and gauges: A, B and C annuli
4 SCSSV function and control-line test **SIT**
5 Tubing and packer: tubing-to-annulus check **SIT**
6 Test pump and recorder: pressure up, hold, bleed
7 MAASP limit the annulus must stay inside

OUTPUT

A pass/fail record per element with the test pressure, hold time and limit, loaded into WelliRS and linked to your SAP work orders, so the next campaign starts from evidence.

1.4 · WELL INTEGRITY MANAGEMENT

Integrity Across the Well Life Cycle

	Drilling and completion	Production and workovers	Suspension and abandonment
Controls	Barrier design, completion and tree acceptance tests	WIT and SIT schedules, MAASP limits, SSSV tests, greasing	Permanent barriers: bridge plugs, cement, bismuth-alloy seals
Monitoring	Installation pressure tests, baseline annulus readings	Annulus pressure trends, noise, temperature and EM surveys	Barrier verification and pressure tests
Decision	Hand-over to production with a verified barrier register	Continue, repair by patch or alloy seal, workover, or shut in	Barrier acceptance and regulatory close-out

⚠ Well integrity saves lives and protects assets: every decision point is recorded in the barrier register, so the next crew inherits evidence, not assumptions.

1.4 · WELL INTEGRITY MANAGEMENT

How the Integrity Service Runs

1. Mobilise crews, office engineer and a resident wellhead specialist
2. Streamlines writes the test programmes for client approval
3. Field execution: WIT, SSSV tests, annulus surveys and MAASP, up to three wells a day once approvals are in place
4. Results logged in WelliRS and linked to the client's SAP for work orders
5. Integrity reporting, repair recommendations, greasing and maintenance

CONTRACTING

Integrated monthly service with a capped fee: crews, engineers, software and testing in one line. SIT available as an optional monthly add-on.

OFFSHORE READY

DNV 2.7-1 / EN 12079 lifting, BOSIET and HUET-certified crews, POB and supply-boat planning, SIMOPS and permit-to-work, weather standby planned in.

1.4 · WELL INTEGRITY MANAGEMENT

Bismuth-Based Alloy

A gas-tight, metal-to-metal barrier formed in minutes, set on wireline or coiled tubing.

IN THIS CHAPTER

02 Overview →
03 Main pillars →
04 How it works →
05 Case study →

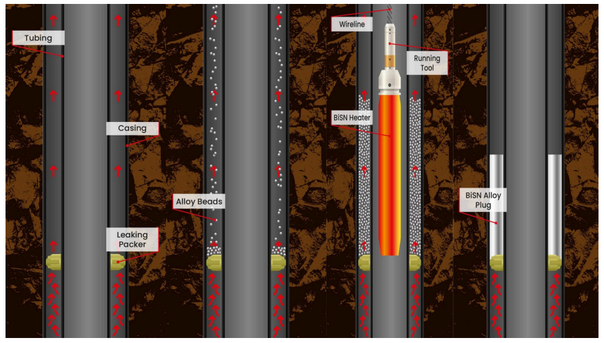


Running tool and heater on wireline

1.4 · BISMUTH-BASED ALLOY

Overview

- Over time, traditional sealing methods such as cement plugs and mechanical barriers can degrade, leading to sustained casing pressure (SCP), gas migration and annular leaks.
- BiSN's bismuth-based alloy technology provides a reliable and permanent sealing solution.
- It forms a gas-tight, metal-to-metal barrier within minutes, ensuring well integrity even in poor downhole conditions.



Repair above a leaking packer: alloy beads, BiSN heater on the running tool, and the finished alloy plug

1.4 · BISMUTH-BASED ALLOY

Main Pillars

Bismuth alloy: melts, expands and seals

- **Low viscosity:** free-flowing, so it fills tight spaces in the wellbore.
- **High SG (9.5–10.5):** contributes to a solid, impermeable seal.
- **Expands like ice:** ideal for tight, pressure-resistant seals.

Thermite chemical reaction: the heat source

- A mixture of metal powder (often aluminium) and metal oxide that reacts and generates a lot of heat.
- Used instead of an electric heater, which would need more power.

1.4 · BISMUTH-BASED ALLOY

How It Works and Applications

HOW IT WORKS

i. The assembled tool is lowered into the well on wireline or coiled tubing (for complex wells) and positioned at the target sealing zone.

ii. The thermite heater is activated and generates the heat required to melt the alloy.

iii. Once in place, the molten alloy cools and solidifies to form a permanent seal.

APPLICATIONS

- Well plug and abandonment →
- Sustained casing pressure (SCP) →
- Water and gas shut-off (zonal isolation) →
- Barrier above the production packer if it fails →
- Repair of damaged casing or tubing →

1.4 · BISMUTH-BASED ALLOY

Case Study: Production Packer Repair, Alaska

CHALLENGE

A supermajor in Alaska had a well with a leaking production packer in the A annulus between 3.5-in tubing and 7-in casing. The operator wanted to repair the packer without a significant workover.

SOLUTION

The operator applied the bismuth-based alloy.

RESULT

Packer repaired without an expensive workover.

- Annular packer set in the 3.5-in × 7-in A annulus
- Bismuth-alloy packer pressure-tested
- Significant cost savings for the operator

1.4 · WELL INTEGRITY · BUSINESS CASE

Well Integrity: Value and Cases

WHY IT PAYS

- Two restored high-risk wells protected **~US$150 million** of assets and 95 MMscf/d of injection gas supporting ~32,000 bopd for six years (ADMA-OPCO, SPE-138238-MS).
- **30–45% of active wells** worldwide carry some integrity issue; sustained annulus pressure alone affects 10–30% of mature stocks (Yakoot et al. 2021; Schulz et al. 2025).
- In Egyptian data, **gas-lift wells show the most severe integrity failures**: 9,000 records, 23 features (GUPCO and FUE, 2022).
- A system turns tests into decisions: MAASP, barrier register, anomaly tracking and KPI dashboards across **>600 wells** (BAPETCO, 2023).

RIGLESS BY DESIGN

Through-tubing logs, EM thickness surveys, casing patches and micro-fine cement diagnose and repair without the rig workover that an integrity anomaly otherwise triggers (SPE-161983-MS; SPE-190888-MS; SPE-138238-MS).

CASE HISTORIES · EGYPT FIRST

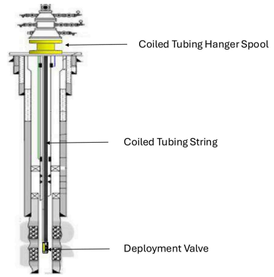
Where · when	What was done	Published result	Source
Egypt · Gulf of Suez, GUPCO · 2005–07	Gap study and risk-ranked well integrity management system for ~600 wells on 90 platforms; high-risk register and a dedicated well-services team	**System embedded across 315 MBLPD at 75% water cut; barrier-failed wells shut in and repaired on a risk basis**	IPTC-11678-MS
Egypt · Western Desert, BAPETCO · 2023	Well-integrity management software: MAASP, well failure model, barrier management, 16 ISO-standard reports	**>600 production and injection wells across six concessions on one integrity record**	Halliburton / Landmark
UAE · Umm Shaif, ADMA-OPCO · 2010	Root-cause analysis, isotope gas tracing, micro-fine cement remediation of the two highest-risk gas wells	**Surface gas bubbling eliminated; ~US$150M of assets restored; 32,000 bopd supported for six years**	SPE-138238-MS
Undisclosed NOC · Wellbore Technology · current	AI annulus-pressure analysis across the well portfolio (vendor testimonial)	**Three wells with developing sustained annulus pressure flagged that manual review had missed**	Wellbore Technology

Sources: IPTC-11678-MS; Halliburton BAPETCO case; SPE-138238-MS; Yakoot et al., JPEPT 2021; Salem, Yakoot, Mahmoud, AGER 2022; Wellbore Technology testimonials

STREAMLINE 01 · PRODUCTION & TECHNOLOGY · SEGMENT 1.5

1.5 Well Intervention

Rigless first: access restored, liquid-loaded gas wells unloaded and tubulars cut or plugged without a rig.



Velocity strings

Live-well coiled tubing for loading gas wells

2 SLIDES →



Torque-Action Debris Breaker

Torque Action Debris Breaker

Tubing access restored on slickline

2 SLIDES →



Electrical cutting tool

Precision cuts on mono-conductor wireline

4 SLIDES →



Eclipse toolbox

Plugs, patches and cuts with no explosives

1 SLIDE →

Overview: Well intervention →

Intervention value & cases →

1.5 · WELL INTERVENTION

Well Intervention: Rigless First

Why rigless

Keeping wells alive without a rig: slickline-deployable tools, live-well installation and no explosives on site.

Torque Action Debris Breaker

Slickline rotary broaching of scale and debris from tubing walls and nipple profiles.

Packers and completion tools

Isolation, hang-off and completion accessories supplied with Eclipse Well Services.

Velocity strings

Coiled-tubing strings run in live wells to restore gas velocity and unload liquids.

Eclipse non-explosive toolbox

Electric setting tools, plugs, patches, cutters and punches with no explosives or lithium.

Electrical cutting tool

Wireline tubing cuts with a machine-shop finish, ready for standard fishing.

1.5 · WELL INTERVENTION

Velocity Strings for Liquid-Loaded Gas Wells

As reservoir pressure falls, gas velocity drops below the critical rate and liquids load up. A smaller-bore coiled-tubing string restores velocity, run and retrieved under pressure with no rig on location.

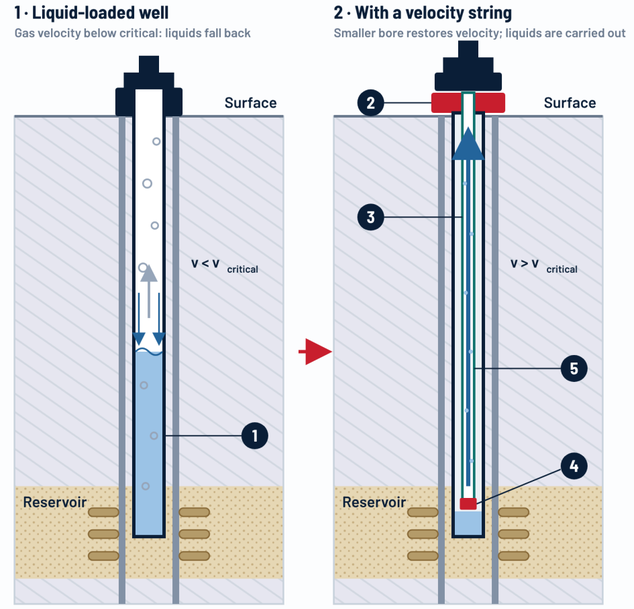
Surface-spool hang-off

Hanger spool below the tree; no load on old tubing; nipple profiles kept for future isolation.

Sub-surface hang-off

Landed downhole on a high-load packer; tree unmodified; simpler operation where restrictions allow.

Candidate engineering comes first: critical-velocity analysis on measured rates, string sizing against the loading model, then post-installation surveillance.



1 Loaded liquid column
2 Hanger spool at the tree
3 CT string inside the tubing
4 Deployment valve
5 Gas above critical velocity

1.5 · WELL INTERVENTION · BUSINESS CASE

Velocity Strings: Value and Cases

WHY IT PAYS

- Installed cost **US$7,000–64,000 per well** for +9,125–18,250 Mcf/well/yr; payback 0–3 years at US$3/Mcf, under a year at US$7 (EPA Natural Gas STAR).
- Rigless and live: **12 days with 8 people** against at least 20 days and more than 50 people for a workover; no kill fluid (Weatherford, Middle East).
- Revives shut-in stock: a well dead for two years came back at **>5 MMscf/d** and ~1,000 B/D condensate (Saudi Aramco, SPE-172527-MS).
- Scales as a campaign: **>110 velocity strings** in one Omani concession, 39 in one field in four years, with a standard screening workflow (PDO, SPE-200241-MS).

PUBLISHED PAYBACK

EPA field case: two Gulf Coast wells at US$25,000 each, +25–50 Mcfd per well, 8-month payback, IRR 155%.

CASE HISTORIES · EGYPT FIRST

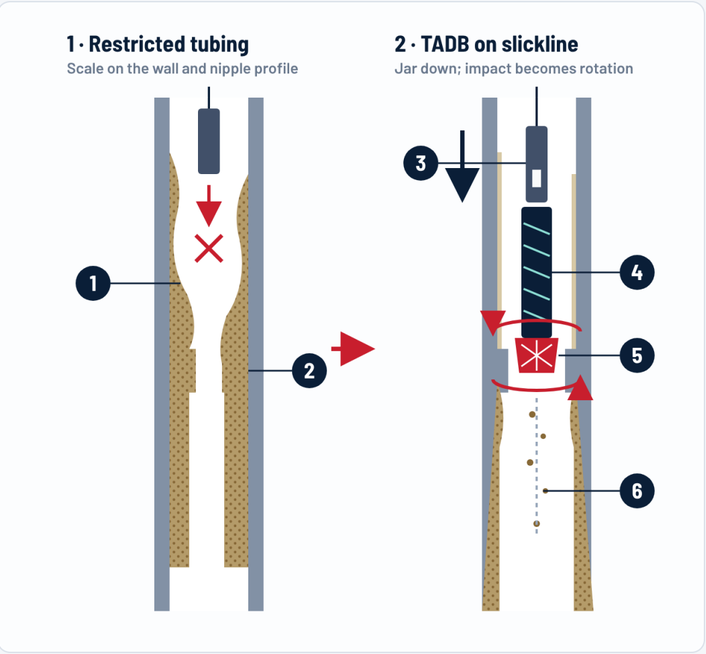
Where · when	What was done	Published result	Source
Saudi Arabia · Saudi Aramco · 2015	10,000 ft 2⅜" coiled-tubing string inside 4½" tubing on a standing high-CGR gas well; rates from the test separator	**Dead for 2 years → >5 MMscf/d at 1,900 psig FWHP with ~1,000 B/D condensate**	SPE-172527-MS
Oman · PDO deep gas · 2023	Velocity strings on liquid-loading wells suffering halite deposition after depletion compression	**Field had lost ~40% of gas to halite; VS wells showed no further deposition, bullheading and CT clean-outs eliminated**	SPE-213501-MS
Middle East · gas well, 9,160 ft · c. 2015–20	2⅜" CT velocity string hung off below the SSSV on a live well; gauges later run inside it	**0–9 MMscf/d with >10 loading shutdowns in 9 months → ~6 MMscf/d without shutdown**	Weatherford
USA · Gulf Coast · 2008	Velocity tubing installed in two wells at US$25,000 each	**+25–50 Mcfd per well; 8-month payback; IRR 155%**	EPA Gas STAR

No published Egyptian velocity-string case; SLB presented velocity-string deliquification at EGYPES 2025 and Streamlines has proposed it to Western Desert and Delta operators.

Sources: SPE-172527-MS; SPE-213501-MS; SPE-200241-MS; SPE-130870-MS; Weatherford Real Results; EPA Natural Gas STAR (2011)

1.5 · WELL INTERVENTION

Torque Action Debris Breaker



1 Scale restricting the bore
2 Fouled nipple profile
3 Slickline jar blow
4 Impact becomes rotation
5 360° cutting shoe
6 Debris falls to the rathole

A slickline-deployed broach that turns downward jarring into rotary cutting, breaking scale and debris from tubing walls and nipple profiles with a 360° cutting face.

Feature	Detail
Body sizes	1½", 1⅞" and 2½"
Shoes	Interchangeable, changed at surface
Make-up	Hexagonal flats for safe make-up and break-out
Connections	To the client's toolstring standard
Sour service	NACE-compliant material option available

Access restored at slickline cost, ahead of gauge, plug, logging and velocity-string runs.

1.5 · TORQUE ACTION DEBRIS BREAKER

Application, Specifications and Advantages

Application

- Removes tubing restrictions caused by scale or debris build-up on the tubing wall or nipple profile.

Specifications

- The main torque body comes in 1-1/2-in, 1-7/8-in and 2-1/2-in sizes, with several shoe sizes that can be easily changed.
- Hexagonal flats for safe make-up and break-out.

Advantages

- During downward jarring, the torque-action mechanism engages, breaking up scale and debris along the tubing walls.
- 360° cutting face ensures full coverage during broaching.
- Connection options to suit customer requirements.



Torque Action Debris Breaker

1.5 · WELL INTERVENTION

Downhole Electrical Cutting Tool

Precision cuts on mono-conductor wireline with a machine-shop finish, ready to fish with standard tools.

IN THIS CHAPTER

02 Why this tool →

03 Components →

04 How the cut is made →



Surface control panel and laptop

1.5 · DOWNHOLE ELECTRICAL CUTTING TOOL

Why the Downhole Electrical Cutting Tool

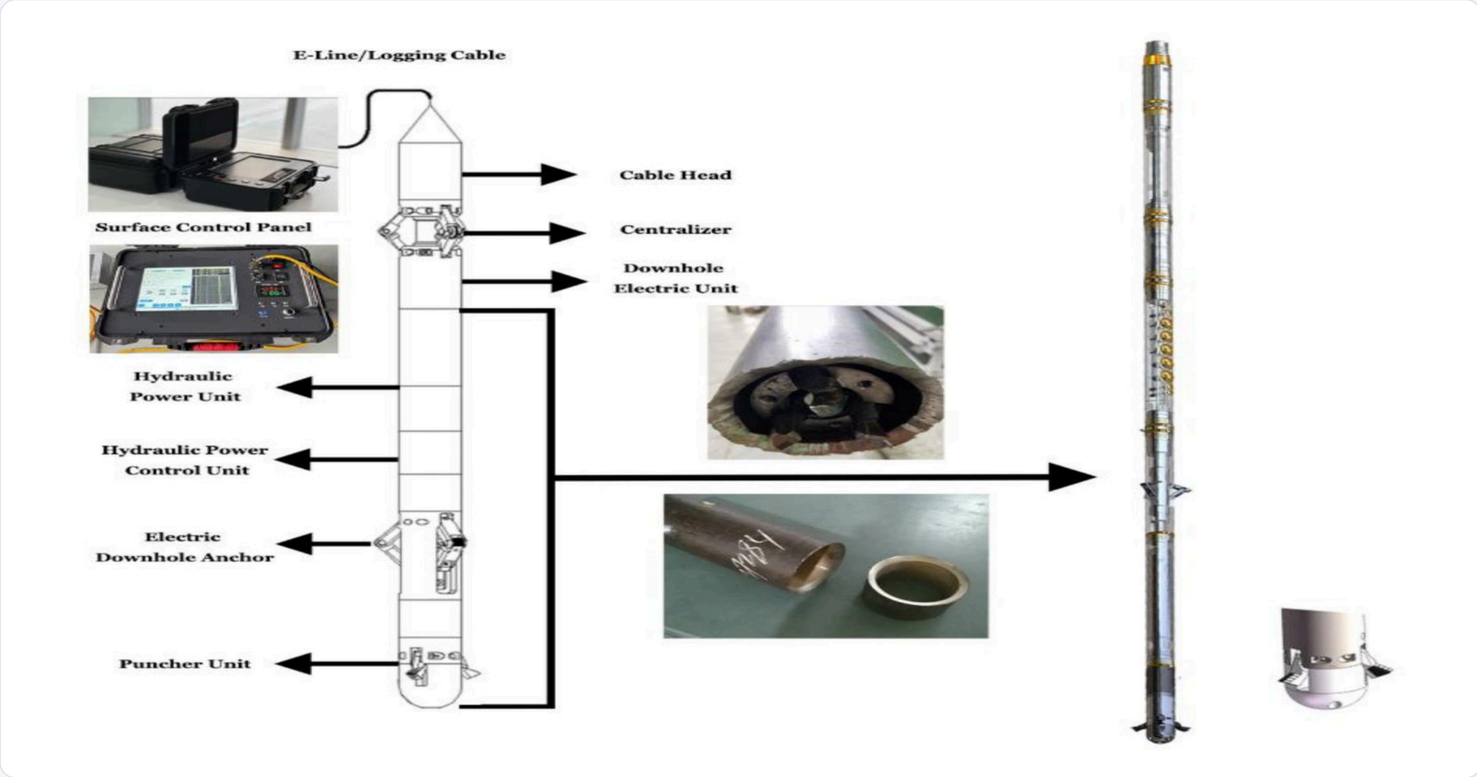
- **It cuts oilfield tubulars with precise control, leaving a machine-shop-quality finish.**
- The remaining pipe can easily be fished using industry-standard techniques, removing the need for subsequent clean-up operations.
- The depth of penetration is accurately controlled, preventing damage to external casing strings and enabling packer retrieval operations.
- It can be deployed on mono-conductor wireline; depth correlation is achieved with an analogue casing collar locator (CCL) or a no-go device in the tool string.



Cutting tool string

1.5 · DOWNHOLE ELECTRICAL CUTTING TOOL

Components



Components of the downhole electrical cutting tool

1.5 · DOWNHOLE ELECTRICAL CUTTING TOOL

How the Cut Is Made

1. The tool operation is controlled with a laptop and control panel at the surface.
2. When the tool is on depth, anchors are set and the cutting operation is initiated.
3. The rotating cutting head is located at the bottom of the tool.
4. Cutting speed, cut penetration and downhole microphone response are monitored in real time, giving a clear indication of a successful cut.



Tool string with the rotating cutting head at the bottom

1.5 · WELL INTERVENTION

Eclipse Well Services: Non-Explosive Toolbox



Tool family	What it does
Electric setting tools	15,000 psi, 135 °C (225 °C option), up to 60,000 lb force, alkaline power
Bridge plugs	Cast-iron, V0-qualified retrievable and high-pressure retrievable
Through-tubing plugs	High-expansion systems, about 3:1, set in casing below restrictions
Patches	Tubing and casing integrity restored in place
Cut, punch, bail	Non-explosive cutters, mechanical punches, cement bailers
Fishing and milling	Through-tubing, metal-stator motor for hostile fluids
Completion tools	Packers and velocity-string hang-off systems

No explosives or lithium | **Fewer personnel** | **Faster mobilisation** | **Lower P&A cost**

1.5 · WELL INTERVENTION · BUSINESS CASE

Debris Breaker and Non-Explosive Tools: Value and Cases

WHY IT PAYS

- Slickline descaling clears what acid cannot — iron sulphide, ZnS/PbS and $CaSO_4$ — at **230–1,600 ft/h**; a 4½" string cleared in 12 hours (Saudi Aramco, SPE-188468-MS).
- **US$250,000 saved** against coiled tubing on one well, followed by a campaign of more than 20 wells (Al-Khafji Joint Operations, SLB).
- Restored drift re-opens the well for gauges, plugs, logging and velocity strings; a slickline footprint suits unmanned platforms (SPE-203113-MS).
- Non-explosive e-line cutting: cuts in **2–7 minutes**, about 75% below rig-based cost, no explosives licensing or radio silence (Welltec; Halliburton UK).

GULF OF SUEZ

A two-month coiled-tubing attempt on hard sulphide scale gave partial results; the torque-action breaker on slickline restored drift from 2.25 in to 2.7 in and then cleaned three more wells better than CT had (SPE-207684-MS).

CASE HISTORIES · EGYPT FIRST

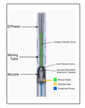
Where · when	What was done	Published result	Source
Egypt · Gulf of Suez, Dragon Oil & GUPCO · 2021	Torque Action Debris Breaker on slickline against ZnS/PbS scale after a two-month CT campaign and a workover	**Drift 2.25 → 2.7 in; three further wells cleaned better than other slickline tools or CT, at far lower cost**	SPE-207684-MS
Saudi–Kuwait DZ · Al-Khafji JO · 2020–21	30 slickline runs cleared calcite bridging in 3½" tubing on a well shut in for five years	**Scale cleared to 3,652 ft; US$250,000 intervention cost saved; >20-well campaign followed**	SLB; MEOS 2021
Saudi Arabia · Saudi Aramco · 2017	First wireline torque-action descaling: 95% iron-compound scale in 4½" tubing after chemical failure	**Tubing cleared in 12 hours at 230–1,600 ft/h, with a fraction of the CT footprint**	SPE-188468-MS
Norway · offshore · undated	E-line mechanical cutter through barium-sulphate scale, 7" tubing at 6,565 ft	**Scale penetrated and tubing cut in 3 hours; ~75% of rig-based cost avoided**	Welltec case

Sources: SPE-207684-MS; SLB KJO case and MEOS 2021 paper; SPE-188468-MS; SPE-203113-MS; Welltec; Halliburton (UK, 2019)

STREAMLINE 01 · PRODUCTION & TECHNOLOGY · SEGMENT 1.6

1.6 Production Optimisation

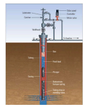
More barrels from the same wells, led by lift and drawdown engineering; EOR, inflow control and chemicals where the data calls for them.



SST gas-lift tool

Supersonic suction from the existing lift gas

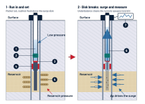
9 SLIDES →



Artificial lift

Beam, long-stroke, plunger, jet pump, ESP

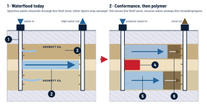
2 SLIDES →



Surge Disk

Our own perforation clean-up and productivity test

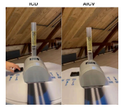
2 SLIDES →



EOR and PSC

Conformance, water shut-off, biocatalyst PSC

2 SLIDES →



Inflow control

Autonomous valves for water and gas

1 SLIDE →



Production chemicals

Quartz programmes, H_2S removal, dosing skids

2 SLIDES →

Overview: Production optimisation →

Engineering: Lift design and optimization →

Engineering: Lift health check →

1.6 · PRODUCTION OPTIMISATION

Production Optimisation: Lift First

Gas-lift enhancement

Gas-lift valve design and change-outs, and the supersonic suction tool that adds drawdown from the existing lift gas.

For gas-lift wells limited by drawdown

Artificial lift

Beam and long-stroke units, plunger lift, jet pumps, ESP and PCP drive heads, selected on the well's own data.

For lifted wells and loading gas wells

Surge Disk perforation clean-up

Our own packer, disk and gauge system: a sudden underbalance cleans the perforation tunnels and measures productivity at first flow.

For new perforations and lift or stimulation decisions

EOR and conformance

Polymer and surfactant flooding, nanobubble and biochemical treatments, gel conformance and water shut-off.

For waterfloods and high water cut

AICV and AOCV inflow control

Autonomous valves that choke water and gas at each inflow point, and even out injection across zones.

For coning, channelling and uneven injectors

Production chemicals and H_2S removal

Quartz programmes for H_2S, scale, corrosion, emulsions, bacteria and foam, plus catalytic H_2S removal beds.

For sour, scaling and corrosive systems

Every programme starts from measurement: well tests, logs and fluid samples define the candidate before anything is pumped or installed.

1.6 · PRODUCTION OPTIMISATION

Gas-Lift Enhancement Tool: Supersonic Suction Tool (SST)

Uses the existing lift gas and a supersonic nozzle to add drawdown, set on slickline with no moving parts.

IN THIS CHAPTER

02 Application and advantages →
03 What drives suction →
04 Slickline procedure →
05 DJ Basin: wells →
06 DJ Basin: design →
07 DJ Basin: evaluation →
08 Bakken and Midland →
09 Conclusions →

Up to 20%
more liquid at the same injection rate

Mach 2.26
at the supersonic nozzle (DJ Basin design)

0
moving parts, wellhead changes or electrics

1.6 · GAS-LIFT ENHANCEMENT TOOL (SST)

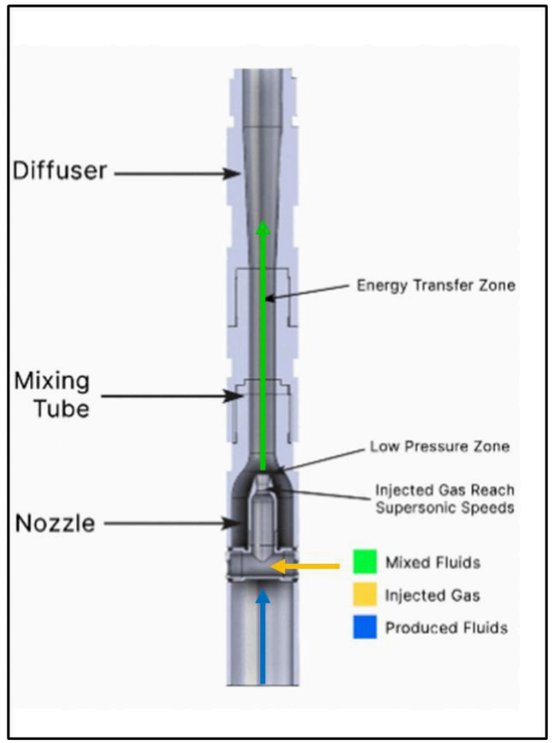
Application and Advantages

Application

- A technology that uses existing gas lift and the suction (venturi) effect to enhance oil production.
- It accelerates the injected gas to supersonic speed in a converging–diverging nozzle, generating suction that adds drawdown and enhances production.

Advantages

- Slickline-deployed; can be installed in almost any existing gas-lift completion.
- No moving parts, no wellhead modifications, no electrical devices or controllers.
- Less gas consumption.



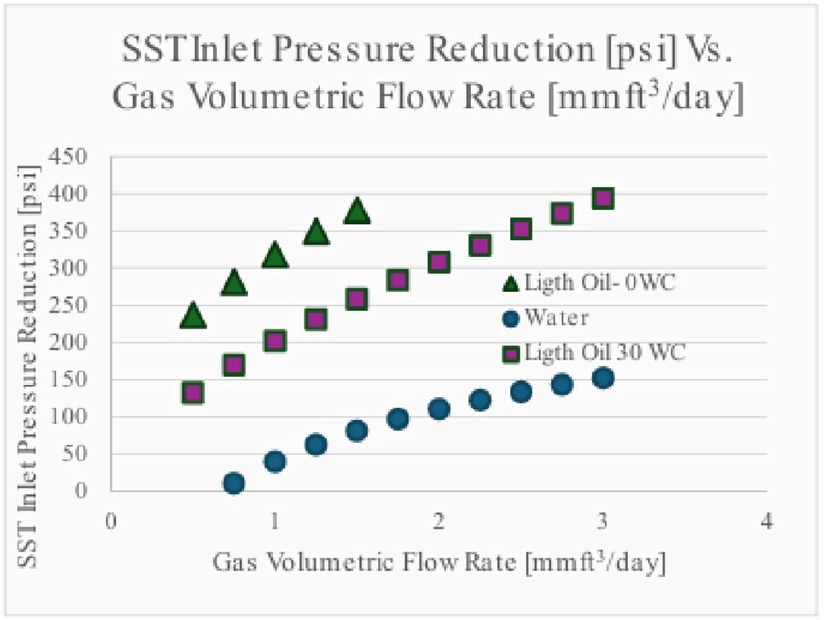
Nozzle, mixing tube and diffuser

1.6 · GAS-LIFT ENHANCEMENT TOOL (SST)

What Drives the Suction

The suction generated by the tool is a function of several factors, mainly:

1. **Pump geometry**
2. **Injected gas rate and pressure**
3. **Flowing bottom-hole pressure**
4. **Produced fluid properties**



How suction varies at different injection rates and fluid properties.

How suction varies at different injection rates and fluid properties

1.6 · GAS-LIFT ENHANCEMENT TOOL (SST)

Running and Installation: Slickline Procedure

1. RIH and set the tubing stop; POOH.
2. RIH and set the pack-off above the tubing stop; POOH.
3. RIH and set the supersonic tool string; POOH.
4. RIH and set the tubing pack-off; POOH.



Tubing stop, pack-off and SST tool string in place

1.6 · GAS-LIFT ENHANCEMENT TOOL (SST) · CASE HISTORY

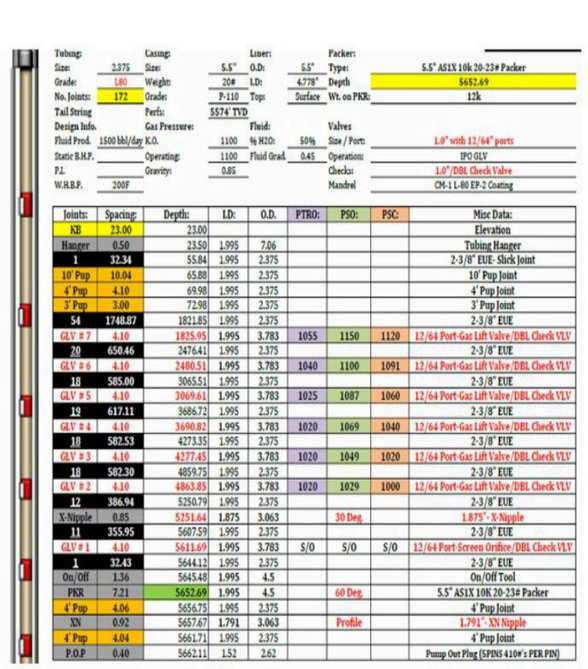
DJ Basin: Introduction and Well Characteristics

Introduction

- The DJ Basin uses gas lift for artificial lift.
- BOG operates ~500 wells, 85% of them on gas lift.
- Injection rates: 350–700 Mscfd; production: 100–1,000 BFPD.

Well characteristics

- Trial on Tatanka 615, 625, 670 and 645.
- 2.375-in tubing inside 5.5-in casing.
- 7 conventional mandrels (CM-1); retrievable packer at ~5,600–6,000 ft landing depth.
- ~65° deviation and ~6–8° dogleg severity.
- 38° API, 30% water cut, 1,800 GOR.



Tubing:		Casing:		Liner:		Packer:	
Size:	2.375	Size:	5.5"	O.D:	5.5"	Type:	5.5" AS1X 10k 20-23# Packer
Grade:	L80	Weight:	20#	I.D:	4.778"	Depth	5652.69
No. Joints:	172	Grade:	P-110	Top:	Surface	Wt. on PKR:	12k
Tail String		Perfs:	5574' TVD				
Design Info.		Gas Pressure:		Fluid:		Valves	
Fluid Prod.	1500 bbl/day	K.O.	1100	% H2O:	50%	Size / Port:	1.0" with 12/64" ports
Static B.H.P.		Operating:	1100	Fluid Grad.	0.45	Operation:	IPO GLV
P.I.		Gravity:	0.85			Checks:	1.0"/DBL Check Valve
W.H.B.P.	200F					Mandrel	CM-1 L-80 EP-2 Coating

Joints:	Spacing:	Depth:	I.D:	O.D.	PTRO:	PSO:	PSC:	Misc Data:
KB	23.00	23.00						Elevation
Hanger	0.50	23.50	1.995	7.06				Tubing Hanger
1	32.34	55.84	1.995	2.375				2-3/8" EUE- Slick Joint
10' Pup	10.04	65.88	1.995	2.375				10' Pup Joint
4' Pup	4.10	69.98	1.995	2.375				4' Pup Joint
3' Pup	3.00	72.98	1.995	2.375				3' Pup Joint
54	1748.87	1821.85	1.995	2.375				2-3/8" EUE
GLV # 7	4.10	1825.95	1.995	3.783	1055	1150	1120	12/64 Port-Gas Lift Valve/DBL Check VLV
20	650.46	2476.41	1.995	2.375				2-3/8" EUE
GLV # 6	4.10	2480.51	1.995	3.783	1040	1100	1091	12/64 Port-Gas Lift Valve/DBL Check VLV
18	585.00	3065.51	1.995	2.375				2-3/8" EUE
GLV # 5	4.10	3069.61	1.995	3.783	1025	1087	1060	12/64 Port-Gas Lift Valve/DBL Check VLV
19	617.11	3686.72	1.995	2.375				2-3/8" EUE
GLV # 4	4.10	3690.82	1.995	3.783	1020	1069	1040	12/64 Port-Gas Lift Valve/DBL Check VLV
18	582.53	4273.35	1.995	2.375				2-3/8" EUE
GLV # 3	4.10	4277.45	1.995	3.783	1020	1049	1020	12/64 Port-Gas Lift Valve/DBL Check VLV
18	582.30	4859.75	1.995	2.375				2-3/8" EUE
GLV # 2	4.10	4863.85	1.995	3.783	1020	1029	1000	12/64 Port-Gas Lift Valve/DBL Check VLV
12	386.94	5250.79	1.995	2.375				2-3/8" EUE
X-Nipple	0.85	5251.64	1.875	3.063		30 Deg.		1.875" - X-Nipple
11	355.95	5607.59	1.995	2.375				2-3/8" EUE
GLV # 1	4.10	5611.69	1.995	3.783	S/O	S/O	S/O	12/64 Port-Screen Orifice/DBL Check VLV
1	32.43	5644.12	1.995	2.375				2-3/8" EUE
On/Off	1.36	5645.48	1.995	4.5				On/Off Tool
PKR	7.21	5652.69	1.995	4.5		60 Deg.		5.5" AS1X 10K 20-23# Packer
4' Pup	4.06	5656.75	1.995	2.375				4' Pup Joint
XN	0.92	5657.67	1.791	3.063		Profile		1.791" - XN Nipple
4' Pup	4.04	5661.71	1.995	2.375				4' Pup Joint
P.O.P	0.40	5662.11	1.52	2.62				Pump Out Plug (SPINS 410#'s PER PIN)

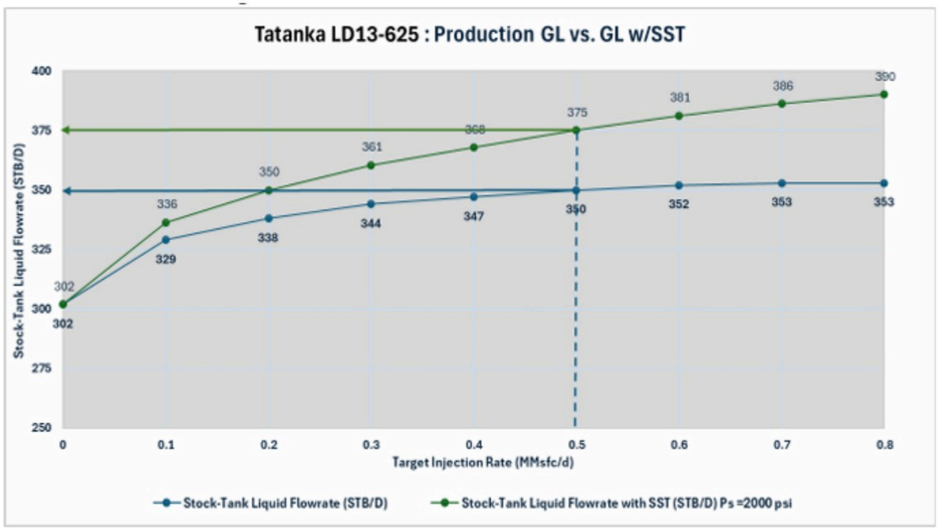
Gas Lift Installation Sheet

Gas-lift installation sheet

1.6 · GAS-LIFT ENHANCEMENT TOOL (SST) · CASE HISTORY

DJ Basin: SST Design and Estimates

- Modelled using PIPESIM.
- Flowing pressure: 700–800 psi; injection: 350–700 Mscfd.
- Estimated suction: 80–85 psi.
- Supersonic nozzle reaches Mach 2.26.
- Expected production gain: ~8%.



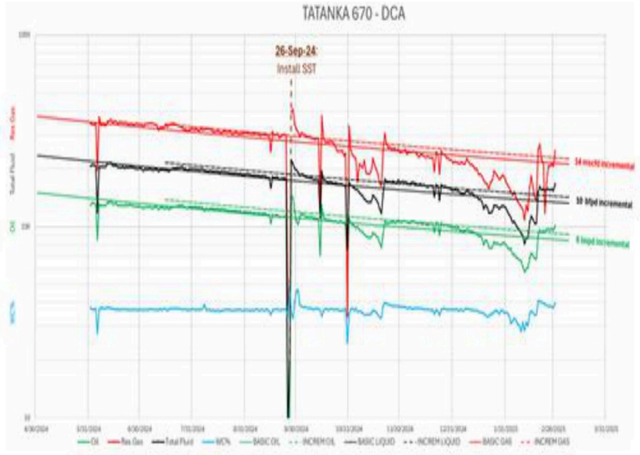
SST Performance Curve

SST performance curve: production with gas lift versus gas lift with SST

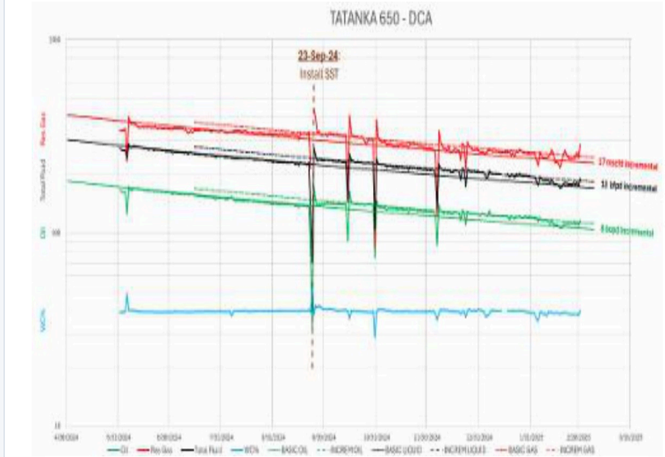
1.6 · GAS-LIFT ENHANCEMENT TOOL (SST) · CASE HISTORY

DJ Basin: SST Evaluation

After the initial installations, the wells were tested and decline-curve analysis (DCA) was used to determine the production gains after installation: as expected and as per design.



Tatanka 670: decline-curve analysis, SST installed 26 Sep 2024

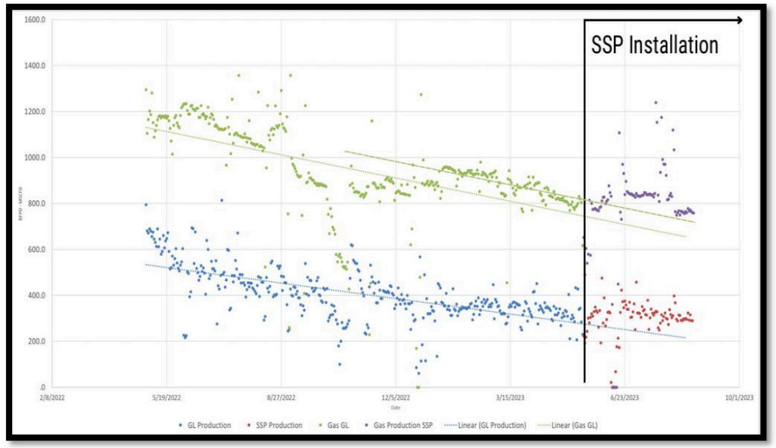


Tatanka 650: decline-curve analysis, SST installed 23 Sep 2024

1.6 · GAS-LIFT ENHANCEMENT TOOL (SST) · CASE HISTORIES

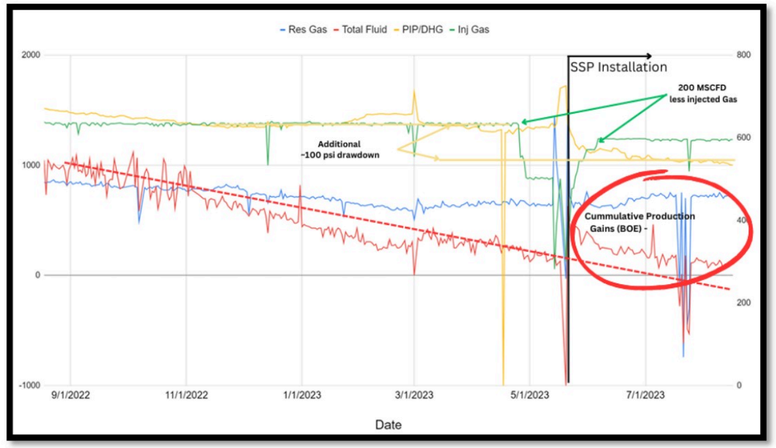
Case Histories: Bakken and Midland Basin

BAKKEN



+12% liquid production and 80 Mscfd of incremental gas production at the same injection rate.

MIDLAND BASIN



+15% (~50 BFPD) production and 250 Mscfd of gas savings at the same injection rate.

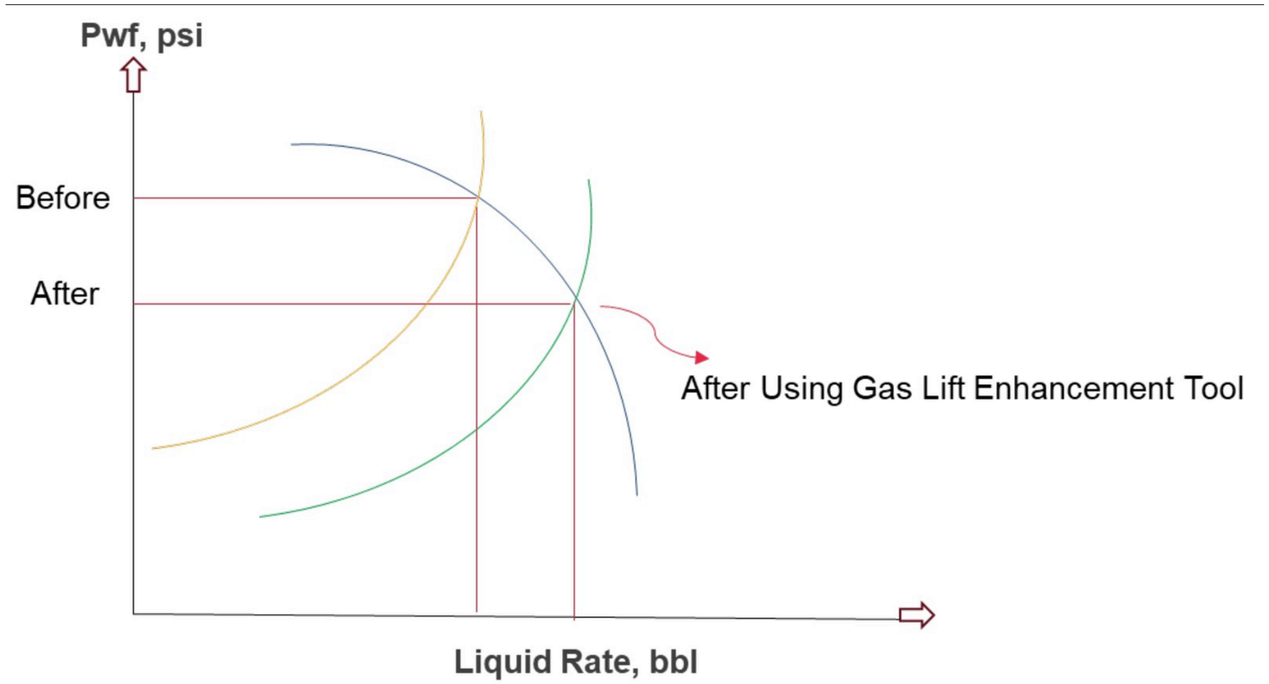
1.6 · GAS-LIFT ENHANCEMENT TOOL (SST)

Conclusions

Up to 20%

incremental liquid production at the same injection rate

The extra drawdown comes from lift gas the well already receives: no new compression, no electrics downhole.



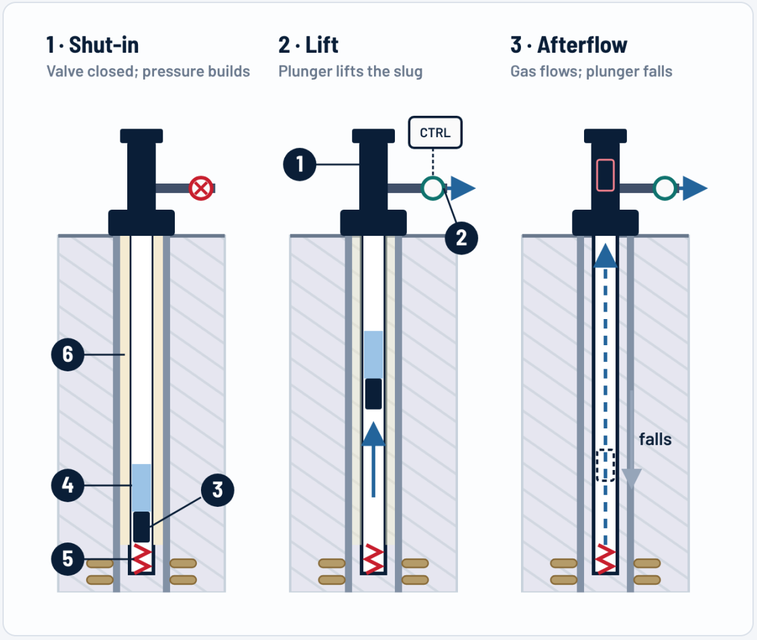
Bottom-hole flowing pressure versus liquid rate, before and after the gas-lift enhancement tool

1.6 · PRODUCTION OPTIMISATION

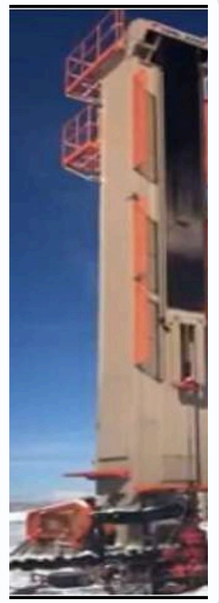
Artificial Lift and Gas-Lift Enhancement

System	Where it fits
Beam and long-stroke units	Rod-lift wells; long stroke for deeper, higher-rate duty
Plunger lift	Liquid-loaded and intermittent gas wells
Jet pumps	Deviated, sandy or gassy wells; no moving parts downhole
ESP	High-rate oil wells and water supply
PCP drive heads	Viscous and sandy crude
Gas-lift valves	Gas-lift design and valve change-outs
Supersonic suction tool	Extra drawdown on gas-lift wells, set by slickline

Plus wireless load-cell automation and Echometer surveys to keep rod-lift wells pumped down, not pumped off.



1 Lubricator and catcher
2 Motor valve and controller
3 Plunger
4 Liquid slug
5 Bumper spring
6 Casing gas: stored energy



Long-stroke unit

1.6 · PRODUCTION OPTIMISATION · BUSINESS CASE

Artificial Lift: Value and Cases

WHY IT PAYS

- Plunger lift is the lowest-capex lift: **US$1,500–6,000 installed** against US$20,000–40,000 for beam lift; payback about one month against 14 (EPA Natural Gas STAR, 2003).
- Automated cycles add **10–20% production** and cut venting; BP automated more than 2,150 San Juan wells (EPA, 2010).
- A 17-well plunger programme returned **NPV ≈ US$9.7 million on ≈ US$1.5 million** capex, +5–6 MMcfd and +6.5 Bcf reserves (UEP Pakistan, SPE-216748-MS).
- Chemical and swabbing costs fall away: **US$52,300/yr** emulsifier saved on one Mexican well with a 30-day payback (Weatherford).

LIFT ON THE WELL'S OWN DATA

Fluid-level and dynamometer surveillance keeps rod-lift wells pumped down, not pumped off; on Egyptian field data, fluid-level-derived pump-intake pressure sits within 12–33% of measured values (JPEPT 2020).

CASE HISTORIES · EGYPT FIRST

Where · when	What was done	Published result	Source
Pakistan · United Energy Pakistan · 2021–23	17 plunger-lift systems in packer-completed loaded gas wells after 2021–22 trials	**+5–6 MMcfd; +6.5 Bcf and 50 MBC reserves; NPV ~US$9.7M against capex ~US$1.5M**	SPE-216748-MS
Mexico · Eagle Ford horizontal · c. 2015	Plunger lift with controller replacing nine manual chemical sticks a day	**Gas 0.35 → 0.50 MMscfd; condensate 10 → 15 BPD; US$52,300/yr chemicals saved; ~30-day payback**	Weatherford
Saudi Arabia · Saudi Aramco · 2021	NACE-compliant plunger lift with automated reporting in a sour, liquids-rich gas well	**Installed in a day; gas and liquids increased; >10,000 plunger miles in two months**	ChampionX / PCS
USA · BP Midland Farm; ExxonMobil Big Piney · 1995–2010	190 plunger units rolled out; 23 units installed	**Install US$10k/well; avoided cost US$20k/well/yr; added production US$22.5k/well/yr; 14,720 Mcf/yr venting cut**	EPA Gas STAR

No published Egyptian plunger-lift field case; vendor papers were presented at SPE NATC Cairo (2012, 2013).

Sources: SPE-216748-MS; Weatherford Real Results; ChampionX/PCS Ferguson; EPA Natural Gas STAR (2003, 2010, 2011); El-Saghier et al., JPEPT 2020

1.6 · PRODUCTION OPTIMISATION · STREAMLINES-OWNED TECHNOLOGY

Surge Disk: Clean Perforations, Measured Productivity

Run with the perforating string: a packer, a surge disk and downhole gauges, with a cushion fluid above the disk. Breaking the disk creates a sudden pressure difference that surges reservoir fluid through the perforation tunnels and cleans them, while the gauges record the well's response.

1 · Run and set

Packer, disk and gauges on the string; cushion fluid sized for the designed underbalance.

2 · Break the disk

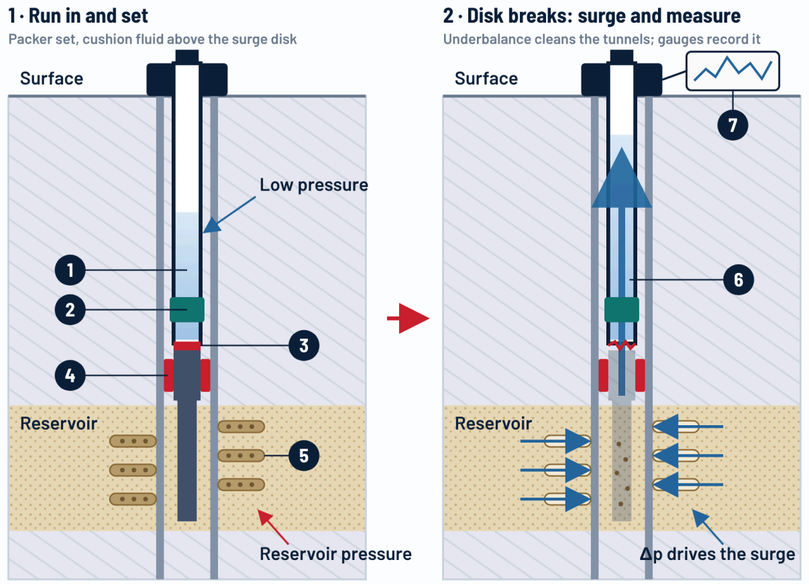
The surge carries debris and crushed rock out of the tunnels into the wellbore.

3 · Measure

Gauge and fluid-level data are interpreted for productivity index and skin.

WHAT YOU GET

Cleaner, higher-conductivity perforations at first flow · productivity and skin from the gauge response · the data to size artificial lift and to decide whether a stimulation job is needed at all. Packer, disk, gauges and interpretation are all Streamlines-owned, with no third-party principal.



1 Cushion fluid (underbalance)
2 Downhole P/T gauges
3 Surge disk
4 Packer
5 Plugged perforation tunnels
6 Surge flow after rupture
7 Surface fluid-level readout

1.6 · PRODUCTION OPTIMISATION · BUSINESS CASE

Surge Perforation Clean-Up: Value and Cases

WHY IT PAYS

- Dynamic underbalance takes perforation skin from about **+20 to –1.2**, and the published wells needed no post-perforation stimulation (Oilfield Review; Brady field).
- **>US$150,000 per well** saved where acid stimulation was no longer required in four of five wells (ChevronTexaco, East Painter).
- Rigless re-perforation as stimulation in the Gulf of Suez: **+20–40% liquids** on four platform wells (SPE-214238-MS).
- Rate against forecast: **+50%** at Ninian; 87 vs 17–52 MMcf/d at NAM; injectivity 18,000 vs 12,000 bbl/d in SE Asia (SLB).

MEASURE WHILE YOU CLEAN

Gauges run with the string measure the underbalance actually achieved and confirm the design; the same data give productivity index and skin for the lift or stimulation decision (PDO, SPE-216441-MS).

CASE HISTORIES · EGYPT FIRST

Where · when	What was done	Published result	Source
Egypt · Gulf of Suez, GUPCO & Dragon Oil · 2023	Dynamic-underbalance re-perforation of damaged intervals on four low-drawdown platform wells	**Tunnel clean-up up to 97%; liquids +20–40%; more than 2,000 bopd added across the four wells**	SPE-214238-MS
Oman · PDO deep tight gas · 2023	DUB perforating with a fast gauge run on the guns ahead of fracturing	**Measured underbalance matched design; treating pressures fell; one zone needed no fracture at all**	SPE-216441-MS
USA · Brady field, Anadarko · 2002–04	Dynamic-underbalance guns from only 400 psi static underbalance	**5.2 MMcf/d at skin –1.17, against offsets at 1–5 MMcf/d with perforation skin above +20**	Oilfield Review
China · Tarim Basin, Sinopec · 2014	Dynamic underbalance with perforating-shock modelling	**Twofold productivity index versus conventional prediction; negative skin**	SLB case study

Published dynamic-underbalance results: the Surge Disk system uses the same mechanism, with Streamlines' own packer, disk, gauges and interpretation.

Sources: SPE-214238-MS; SPE-216441-MS; Bakker et al., Oilfield Review; SLB case studies (Tarim; SE Asia); Halliburton (Cameroon 2016)

1.6 · PRODUCTION OPTIMISATION

EOR, Conformance and Water Shut-Off

Polymer and surfactant flooding

Screening, lab work on your crude and brine, pilot design, injection skids and surveillance: when to start, and when to stop.

Nanobubble and biochemical

Protein-surfactant complex with nanobubble water to lower interfacial tension and shift wettability.

Conformance and WSO

Gels and microgels placed on logged evidence to close thief zones and cut water at source.

Stimulation

MaxStim Fusion and six-in-one safe-acid and microemulsion treatments for mixed damage.

HOW AN EOR PROGRAMME RUNS

Screening → Laboratory → Pilot design → Pilot with gates → Field rollout

Surveillance runs throughout: injectivity, water cut and oil response are measured against the baseline at every gate.

1.6 · EOR AND CONFORMANCE

Biocatalyst PSC: IOR/EOR Technology

Protein–surfactant complex (PSC) is a hybrid biochemical EOR agent that combines the surface activity of surfactants with the structural properties of proteins.

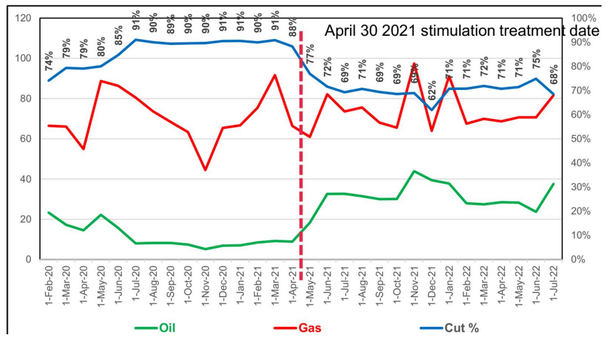
Light oil

- Lower IFT
- Alter wettability
- Eliminate water blockage
- Improve relative permeability

Heavy oil

Mixed with solvent to create a microemulsion that cuts viscosity and raises oil mobility, on top of the light-oil functions.

PSC reduces water cut through mechanisms that control water flow, alter reservoir properties and improve oil–water separation.



Well #A: oil, gas and water cut before and after the 30 April 2021 treatment

+176%

Well #A oil, 15 months after vs before (+49% gas)

23–42%

Well #B water cut after treatment, from 67–80% before

1.6 · PRODUCTION OPTIMISATION

Autonomous Inflow Control: AICV and AOCV

Valves that read fluid viscosity: viscous oil keeps them open, thin water or gas closes them. Each compartment regulates itself for the life of the well, with no electronics, sensors or control lines.

AICV on producers

Chokes water and gas progressively as water cut rises, beyond what a passive ICD can do.

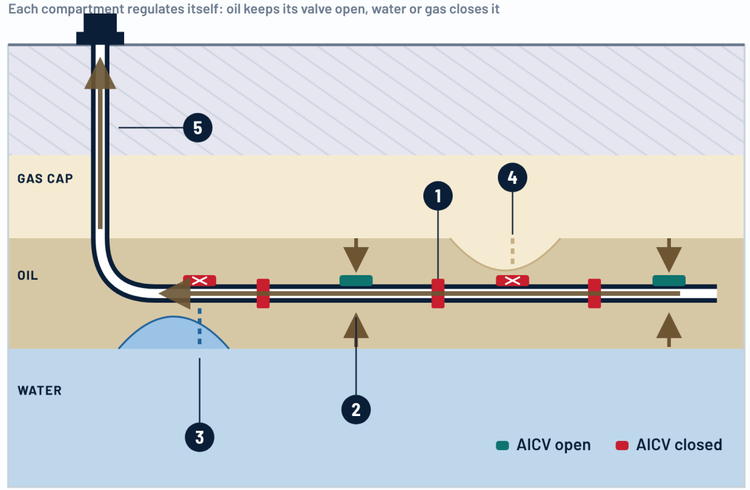
AOCV on injectors

Holds near-constant flow per zone so thief zones stop taking the injection water.

Installed with the completion or retrofitted into many existing wells; vertical, deviated and horizontal. Candidates are screened on PLT and noise-log evidence.

Autonomous inflow control along a horizontal well

Each compartment regulates itself: oil keeps its valve open, water or gas closes it



1 Swell packers isolate zones
2 AICV open on oil
3 Water breakthrough choked
4 Gas breakthrough choked
5 Balanced inflow to the heel

1.6 · PRODUCTION OPTIMISATION

Production Chemicals: Quartz

H_2S scavengers
Non-triazine options for gas and multiphase

Scale control
Inhibition and removal programmes

Corrosion inhibitors
Wells, flowlines and facilities

Demulsifiers
Faster, cleaner oil-water separation

Biocides and defoamers
Bacteria and foam under control

Chemical injection skids
Multi-point dosing from one metered pump

Every programme starts with fluid sampling and laboratory screening on your own crude, brine and gas, and is dosed through metered chemical injection skids.



ALSO AVAILABLE

Catalytic H_2S removal beds with 18–24 month bed life and no liquid chemicals.

1.6 · PRODUCTION CHEMICALS

H_2S Treatment and Chemical Injection

H_2S scavengers

No single scavenger suits every application: choosing the right product and injection point is the key to success.

- Non-triazine and versatile
- For gas and/or multiphase
- Faster reaction; fewer side reactions downstream

Nano catalytic H_2S adsorbent

Inlet → pre-filtration → adsorption bed (H_2S and CO_2) → post-filtration, with a bypass for maintenance. No solvent circulation, heaters, chillers or pumps.

Biogas, Malaysia: H_2S cut from 1,300–2,000 ppm to 5–20 ppm, with an 18–24-month adsorbent life.

Chemical injection skid

Precise dosing of corrosion and scale inhibitors and demulsifiers; multi-point injection from a single pump.

- Measurement: positive-displacement flow meter (PDFM)
- Control: chemical injection metering valve (CIMV)
- Actuation: actuator

02

STREAMLINE 02

Consultancy & Engineering (CISS)

Engineering capabilities behind every technology: surveillance and well-test analysis, production and lift engineering, deferral, capacity and integrity, delivered with stated acceptance criteria.

01 **Consultancy overview** — 3 slides →

02 **Surveillance engineering** — 4 slides →

03 **Production engineering** — 5 slides →

04 **Capacity, deferral and integrity** — 3 slides →

05 **Practice areas** — 4 slides →

06 **How studies are delivered** — 4 slides →

07 **CISS value & cases** — 1 slide →

STREAMLINE 02 · CISS · ORIGINAL OVERVIEW

Streamlines Oil & Gas Consultancy

- Expert consultancy services with proven success.
- Experience in geophysics, geology, reservoir engineering, static and dynamic modelling, production optimization and gas-lift design.
- Trusted by industry leaders such as OSOCO, Petrogulf and Eshpetco.
- **Client success story, OSOCO partnership:** Streamlines showed deep expertise from planning through analysis, providing crucial insights for production optimization.



Production optimization

Exceeded expectations with innovative techniques.

Reservoir modelling

Expert data integration shaped the vision.

Gas-lift design

Efficient system implementation.

STREAMLINE 02 · CISS

CISS Practice Map

2.1 Subsurface & Reservoir

Seismic, petrophysics, static and dynamic models, history matching, geomechanics

tNavigator · Interactive Petrophysics

2.2 Reserves, FDP & Portfolio

PRMS and SEC reserves, development plans, EOR screening, economics, scheduling

PetroVR · Val Nav · Planning Space

2.3 Production & Wells

Deliquification, lift design, gas-lift, nodal analysis, deferral, well health checks

Well and network models · Peloton

2.4 Process & Facilities

Process modelling and simulation: H&MB, PFDs, equipment inputs, debottlenecking

Steady-state and dynamic simulation

2.5 Asset Performance & Cost

Asset health checks, cost-per-barrel reviews, unit technical cost, cost optimisation

Quorum economics · analytics

2.6 HSSE & Integrity

Integrity programmes, MAASP, barrier management, process safety, HAZOP and HAZID

WelliRS

Models are built on platforms we implement and support, so they outlive the study.

STREAMLINE 02 · ENGINEERING CAPABILITIES

One Loop: Measure, Analyze, Decide, Execute, Learn

Meters measure, software analyzes, consultancy decides, engineering executes, training locks it in, and surveillance feeds the next study.

STRONGER PORTFOLIO | **SAFER & COMPLIANT** | **MORE BARRELS & RESERVES** | **LOWER $/BBL**



CONTINUOUS IMPROVEMENT · SURVEILLANCE FEEDS THE NEXT STUDY

Stronger portfolios

Certified reserves, defensible models and PetroVR-class planning turn technical work into bankable positions.

Safety & compliance

Barrier management, RBPS gap assessments, flare and produced-water programmes, evidenced to ISO 14001/45001 discipline.

More production & reserves

Deferral restoration, lift optimization, EOR and bypassed-pay hunts add barrels; dual-method reserves work books them.

Lower cost per barrel

The Unit Technical Cost programme attacks both sides of the ratio, governed by one KPI tree from boardroom to control room.

ENGINEERING CAPABILITIES · SURVEILLANCE

Surveillance and Well-Test Analysis

Pressure- and rate-transient analysis, fluid characterization, production logging and formation-pressure programmes: the surveillance that keeps the reservoir model honest between studies.

Well-test analysis: PTA · RTA · virtual metering

Log-log derivative diagnosis of permeability, skin, boundaries and drainage volume; RTA extracts kh, connected volumes and EUR from daily data without shut-ins; virtual metering fills per-well rates between tests.

Fluid characterization & EOS tuning

Laboratory PVT checked for consistency before it is trusted; equation-of-state models tuned to CCE, differential-liberation and separator tests; black-oil tables exported simulator-ready.

PLT & well-integrity log interpretation

Zonal contributions from spinner, temperature and density passes; water and gas entries and crossflow found; cement-bond, caliper and corrosion logs read against the barrier schematic.

RFT design & analysis

Stations placed where the objectives are; fluid gradients, contacts and free-water level; vertical and areal communication assessed and depletion mapped per reservoir.

CASE STUDY · ANONYMIZED

Surveillance-led well and reservoir review

Producing-asset operator

SCOPE

Turn scattered well tests, production logs and pressure surveys into one picture of what each well and reservoir is actually doing.

DELIVERED

PTA/RTA on the key wells; EOS retuned to validated PVT; PLT water-entry diagnosis on the problem wells; an RFT depletion map; one ranked intervention and data-acquisition plan.

kh & skin per key well | EOS matched to lab data | Ranked intervention plan

ENGINEERING CAPABILITIES · SURVEILLANCE

Surveillance Products and Measurement Technology

The meters and logging tools from our Production & Technology segment that put surveillance, allocation and capacity work on measured ground.

Multiphase flow meters (MPFM)

Three-phase rates without separation: sizing, technology selection, installation support and validation against well tests where test separators are the bottleneck.

Ultrasonic clamp-on measurement

Non-intrusive flow measurement installed without shutdown: flare lines, water systems and allocation gaps metered where spool pieces are impossible.

Production logging tools

PLT strings run and interpreted by the same team: zonal contribution, water entry and injection conformance feeding straight into the surveillance practice.

Deployment discipline

Every meter specified against duty, validated at installation and wired into the allocation and reporting framework: hardware that serves the dataset.

CASE STUDY · ANONYMIZED

MPFM-based well testing and allocation upgrade

Multi-station producing operator

SCOPE

Close a chronic well-test backlog and put allocation on measured rates without new test separators.

DELIVERED

MPFM selection and sizing per station; installation and validation against separator tests; clamp-on coverage of flare and water lines; meters wired into the allocation dataset, with reconciliation factors converging toward 0.95–1.05.

Test backlog cleared · Flare & water metered non-intrusively · RF converging to spec

Smart MPFM → · Mobile MPFM → · Clamp-on flow meter →

ENGINEERING CAPABILITIES · SURVEILLANCE

Well-Test and Metering Campaigns

Testing and metering run as operations, not just analysis: campaigns designed, supervised and interpreted so every rate is a number you can build on.

Campaign design

Test objectives, sequence and duration engineered for the questions asked, with PTA-grade shut-ins only where they pay.

Field supervision

Test execution witnessed; separator, MPFM and clamp-on measurements verified in situ; data QC'd before the crew leaves.

Interpretation on the spot

kh, skin, boundaries and AOF read while the spread is still rigged, so extensions are decided on evidence, not habit.

Into the dataset

Results reconciled into allocation, IPM models and the reserves database: one campaign, every downstream user served.

CASE STUDY · ANONYMIZED

Field-wide test and metering campaign

Multi-field operator

SCOPE

Clear a two-year well-test backlog and re-anchor allocation in one integrated campaign.

DELIVERED

Risk-ranked test sequence; MPFM and clamp-on meters where separators could not reach; on-site PTA with same-day extend-or-cut decisions; meter factors re-baselined and results reconciled into allocation and the reserves database.

Backlog cleared in one season · kh & skin per key well · Allocation re-anchored

Well test set-up → Testing services →

Home Agenda Technologies ↑ CISS

‹ Consultancy overview Production engineering ›

110 / 155

ENGINEERING CAPABILITIES · ENGAGEMENT SPOTLIGHT

The Meters That Paid for Themselves

Anonymized · multi-station producing operator

THE CHALLENGE

Allocation by difference, a two-year test backlog and flare volumes nobody would sign for: every monthly report an argument.

OUR APPROACH

MPFM and clamp-on meters specified by duty; installation validated against separator tests; meter factors control-charted; every stream wired into one certified dataset.

THE OUTCOME

Reconciliation factors converging to 0.95–1.05, a defensible flare number, and monthly allocation that closes without a meeting.

0.95–1.05
Reconciliation-factor band

2 yrs
Test backlog cleared

100%
Streams metered or estimated to spec

1
Certified dataset for all reports

ENGINEERING CAPABILITIES · PRODUCTION ENGINEERING

Artificial-Lift Design and Production Optimization

From data QC to an economically ranked lift programme: an integrated workflow in which no design decision is taken on a stand-alone well model.

1 Data gathering & QC

Client data assembled digitally; every gap logged and closed with agreed assumptions before modelling.

2 P&ID validation

Diagrams checked against the real network to capture unrecorded changes; measurement and allocation methods documented.

3 Wellbore modelling

Well models, including gas-lifted wells, built and coupled to reservoir and surface facility models.

4 Lift screening

ESP, gas lift, rod, jet and plunger evaluated on physics and economics, not habit or vendor preference.

5 Gas-lift design

Valve depths, sizes and types; optimum injection rate by sensitivity; unloading simulated, stability assessed.

6 Forecast & economics

Production predicted per lift mode over time; NPV-based analysis ranks the options.

CASE STUDY · ANONYMIZED

Artificial-lift health check and optimization

Producing-field operator

SCOPE

Assess whether existing lift systems were leaving production behind, and rank the corrective actions worth taking.

DELIVERED

Well models rebuilt and matched to current tests; lift performance checked against design; completion and injection-rate sensitivities per well; actions ranked with the surface network's response deciding the order.

Well-by-well lift health check | Ranked optimization actions | Network-coupled evaluation

ENGINEERING CAPABILITIES · PRODUCTION ENGINEERING

Artificial Lift: Design, Health Check and Troubleshooting

Every major lift system covered end to end: designed for the well it serves, health-checked against its own design, and troubleshot to root cause.

ESP

Staging and sizing against inflow; VSD envelopes; gas handling; downhole-sensor trending for early failure warning; teardown-informed run-life improvement.

Gas lift

Valve spacing, sizing and type; optimum injection rate by sensitivity; unloading simulated and stability verified; lift-gas allocation across the network.

Sucker rod / beam

Rod-string and pump sizing; dynamometer-card diagnostics; counterbalance and gearbox loading; pump-off control tuned for gassy and deviated wells.

Jet pump

Nozzle-throat sizing and power-fluid design; cavitation screening; a strong fit for sandy, deviated or remote wells needing rigless retrieval.

Plunger lift

Liquid-loading screening for gas and high-GLR wells; plunger type and cycle design; controller tuning; intermittent gas lift where pressure fades.

Unconventional & hybrid

High-pressure gas lift, gas-assisted plunger, ESP-to-gas-lift transitions and rod-lift conversions: a lift strategy staged across the well's life.

Health check and troubleshooting: baseline versus design → surveillance trending → diagnostics (sensor data, dyno cards, valve surveys, well tests) → root cause → corrective actions ranked by NPV.

ENGINEERING CAPABILITIES · ENGAGEMENT SPOTLIGHT

Fifteen Wells, One System, Every Barrel Priced

Anonymized · offshore Gulf of Suez producer

THE CHALLENGE

Lift decisions were being made well by well while the surface network quietly took back what the designs promised.

OUR APPROACH

Every existing and planned well modelled and coupled to the network; ESP versus gas lift screened on physics and economics; gas-lift designs simulated through unloading; do-nothing and optimized forecasts.

THE OUTCOME

Gas lift selected on evidence, valve designs issued, and a debottlenecking sequence ranked by NPV: deferred production made visible and recoverable.

15
Wells, existing and planned

±15%
Match criteria met

GL
Selected on economics

NPV
Ranked action list

Gas-lift enhancement tool (SST) →

ENGINEERING CAPABILITIES · PRODUCTION ENGINEERING

Integrated Production Modelling

A complete integrated model of your production system, built, calibrated, optimized and handed over with your engineers trained to run it.

Framing & data analysis

Opportunity framing with your team and full data analysis, closed with an inception report so scope, assumptions and data are agreed before modelling.

Model build & calibration

Well, reservoir and network models coupled on Petroleum Experts IPM (PROSPER, MBAL, GAP, RESOLVE, PVTP) and calibrated to an agreed base case.

Multi-scenario optimization

Bottlenecks identified at each step; gas-lift and choke settings optimized system-wide; options compared on production and economics.

Assurance, hand-over & training

Every case reviewed with your stakeholders, a completion report, and on-job training for your engineers on the handed-over models; OpenServer automation scripts stay with you.

CASE STUDY · ANONYMIZED

IPM build with capability transfer

Offshore gas-condensate operator

SCOPE

One calibrated model of the production system, and a client team able to keep it.

DELIVERED

PROSPER/GAP/MBAL suite built and matched; multi-scenario optimization across operating envelopes; OpenServer reporting automation; five client engineers trained on-job through hand-over.

±15% match achieved | System-wide optimization live | 5 engineers trained on-job

ENGINEERING CAPABILITIES · PRODUCTION ENGINEERING

Production Enhancement and Evaluations

A defined process for improving existing wells and finding bypassed opportunity: the most cost-effective barrels on a declining asset.

1 Collect & screen data

Data analyses, wellbore utilization and material-balance screening across large well populations.

2 Identify gaps & prioritize

Log analysis, flow evaluation, well-test interpretation, decline analysis and nodal modelling isolate the gap per well.

3 Recommend & design

Per candidate: re-perforate, acidize, fracture, install or modify artificial lift, infill or lateral drilling.

4 Execute & evaluate

Post-treatment evaluation against forecast; economics confirmed; screening model updated.

CASE STUDY · ANONYMIZED

Field-wide production enhancement screening

Mature-field operator

SCOPE

Offset decline without new wells: find, rank and design the interventions hiding in an existing well stock.

DELIVERED

Screening across the full stock; production-gap diagnosis per candidate (logs, tests, declines, nodal); designs for re-perforation, acid and lift changes ranked by uplift and economics; a post-treatment evaluation loop.

Full stock screened | Ranked intervention inventory | Post-job evaluation loop

ENGINEERING CAPABILITIES · OPERATIONS

Capacity Management and Locked-In Potential

Set the true production capacity of the system month by month, then make the barrels locked behind every constraint visible, valued and recovered.

Constraint chain, end to end

Reservoir-, well-, facility- (oil and water) and export-constrained limits established per station and per train.

The lowest choke decides

A monthly capacity decision per station identifies the governing constraint; water-handling limits converted to equivalent oil by creaming-curve analysis.

Make it visible

Locked-in potential quantified across every function, with dilution and burn-down tracking: a leadership view with drill-downs for every level.

Value-based prioritization

Recovery ranked on true system value ($/bbl), not single-well gains; a KPI cascade from leadership (L0) to working teams (L4).

CASE STUDY · ANONYMIZED

Integrated capacity and locked-in-potential programme

Super-giant field operator

SCOPE

Make locked-in barrels visible across all functions and set the field's true capacity month by month, station by station.

DELIVERED

Monthly integrated-capacity decisions across reservoir, wells, facility and export constraints; creaming-curve analysis for water-constrained stations; a people-process-technology roadmap; an L0–L4 dashboard cascade.

Lowest-choke capacity governance

People · process · technology roadmap

L0–L4 KPI cascade

ENGINEERING CAPABILITIES · OPERATIONS

Production Deferral Management and Restoration

Deferrals managed by source and cause through their full life cycle, on allocation and reporting foundations you can trust.

Allocation & reconciliation

Reconciliation methods designed and stress-tested; factors managed toward 0.95–1.05; error sources found in test coverage, water-cut sampling and meter factors.

Integrated production reporting

Daily, monthly and annual streams in one certified dataset with embedded allocation logic (GOR, WC, GLR); ~80% of routine data entry automated as a target.

Source & cause deferral management

A taxonomy that records why flow ceased, not just that it did; 5-Whys and RCFA discipline; reviews from daily loss meetings to quarterly asset-wide.

Restoration & recovery

Every deferral carries a recovery plan with an owner and a date, tracked to closure and ranked by value; machine learning flags emerging trends and high-risk wells.

CASE STUDY · ANONYMIZED

Production reporting and deferral transformation

Super-giant field operator

SCOPE

Event-level deferral tracking and fragmented manual reporting were capping the value of a solid operation.

DELIVERED

Source-and-cause deferral framework; integrated reporting around one certified dataset; governance cadence and a 0–24-month roadmap targeting full alignment, ≥50% less manual reconciliation and ~80% automated data entry.

19+ loss sources made visible

≥50% less manual reconciliation (target)

One certified dataset

ENGINEERING CAPABILITIES · WELLS

Well Integrity Management

Every well a verified barrier system: statuses known, annulus pressures managed, and ageing wells kept honest between workovers.

Barrier verification

Well barrier schematics and verification status per well; safety-critical valves and SCSSV testing regimes reviewed for coverage and closure.

Annulus pressure management

Sustained casing pressure diagnosed, thresholds set, and monitoring and bleed-down practices formalized.

Ageing & change of service

Integrity reassessment for late-life wells, producer-to-injector conversions and suspended stock.

Integrity statements

Well integrity statements and risk-ranked anomaly registers feeding the maintenance and workover plan.

CASE STUDY · ANONYMIZED

Well integrity baseline across a mature stock

Mature-asset operator

SCOPE

Establish the true integrity status of a mixed-age well stock and rank what to fix first.

DELIVERED

Barrier schematics and verification status for the stock; sustained-casing-pressure diagnosis and thresholds; a risk-ranked anomaly register with workover priorities; integrity statements aligned to the operator's assurance framework.

Full-stock barrier baseline · Risk-ranked anomaly register · Workover plan prioritized

WIT / SIT testing → · EPDT multi-pipe inspection → · Noise and temperature logging → · Bismuth-alloy barriers →

2.1–2.2 · SUBSURFACE, RESERVES & PORTFOLIO

From Reservoir Model to Booked Reserves

Subsurface and reservoir

Seismic interpretation and inversion
Petrophysical evaluation on Interactive Petrophysics
Static models: structure, facies, properties
Dynamic simulation and assisted history match on tNavigator
Image-log and geomechanics studies
Waterflood, EOR and CO_2-storage screening

Reserves, FDP and portfolio

PRMS and SEC estimation, classification and reconciliation
Probabilistic ranges: P90, P50, P10
Field development plans and waterflood optimisation
Economics under Egyptian PSA terms
Portfolio planning, rig and activity scheduling
Asset and project valuation

Deliverables: models handed over on your licences, reports that meet the acceptance criteria agreed at the start, and workshops with your team.

2.3 · PRODUCTION & WELLS ENGINEERING

Production and Wells Engineering Studies

EXAMPLE: GAS-WELL DELIQUIFICATION AND REVIVAL STUDY

1. Well inventory, data QC and loading symptoms
2. Critical-rate screening: Turner and Coleman
3. Nodal analysis: inflow and outflow per well
4. Solution design: velocity-string sizing, plunger lift cycles (Foss and Gaul)
5. Economics, ranking and a pilot with surveillance

ALSO IN THIS PRACTICE

- Artificial lift selection and design
- Gas-lift design and optimisation
- Integrated well and network models
- Deferral management and restoration
- Model-based well health checks
- Well integrity programmes and MAASP

2.4 · PROCESS & FACILITIES

Process Modelling and Simulation

From process data to engineering deliverables: an engineering service built on simulation, not a software licence.

1 · DATA
Plant data, compositions, design basis and operating envelopes collected and checked

→

2 · MODEL
Process model built and validated against measured plant performance

→

3 · SIMULATE
Cases, sensitivities and optimisation of the operating point

→

4 · DELIVER
H&MB, PFDs, equipment design inputs and debottlenecking studies

WHO IT SERVES

- Gas processing and treatment
- Refining
- Petrochemicals
- Chemical and industrial processing
- Upstream facilities
- EPC contractors

2.5–2.6 · ASSET PERFORMANCE, COST, HSSE & INTEGRITY

Asset Performance, Cost and HSSE Studies

Asset performance and cost

Asset health checks across subsurface, wells and facilities
Cost-per-barrel and value-erosion reviews
Unit technical cost and cost optimisation
Capacity, deferral and locked-in potential
Organisational KPIs and performance management
Transaction, JV and portfolio advisory

HSSE and integrity

Well integrity programme and policy design
MAASP, barrier and annulus assessments
Process safety gap assessments
Barrier and safety-critical element management
HAZOP and HAZID facilitation
Environmental compliance and produced water

Built for management: each review ends with a ranked list of actions, their value and who owns them.

STREAMLINE 02 · CISS

How CISS Engagements Run

1 Framing workshop

2 Data and acceptance criteria

3 Study and weekly reporting

4 Review workshops

5 Technical assurance sign-off

6 Hand-over and training

Fixed-scope studies

Defined deliverables, price and schedule.

Integrated programmes

Several practices on one asset, one study manager.

Embedded engineers

Engineers and advisors working inside your team.

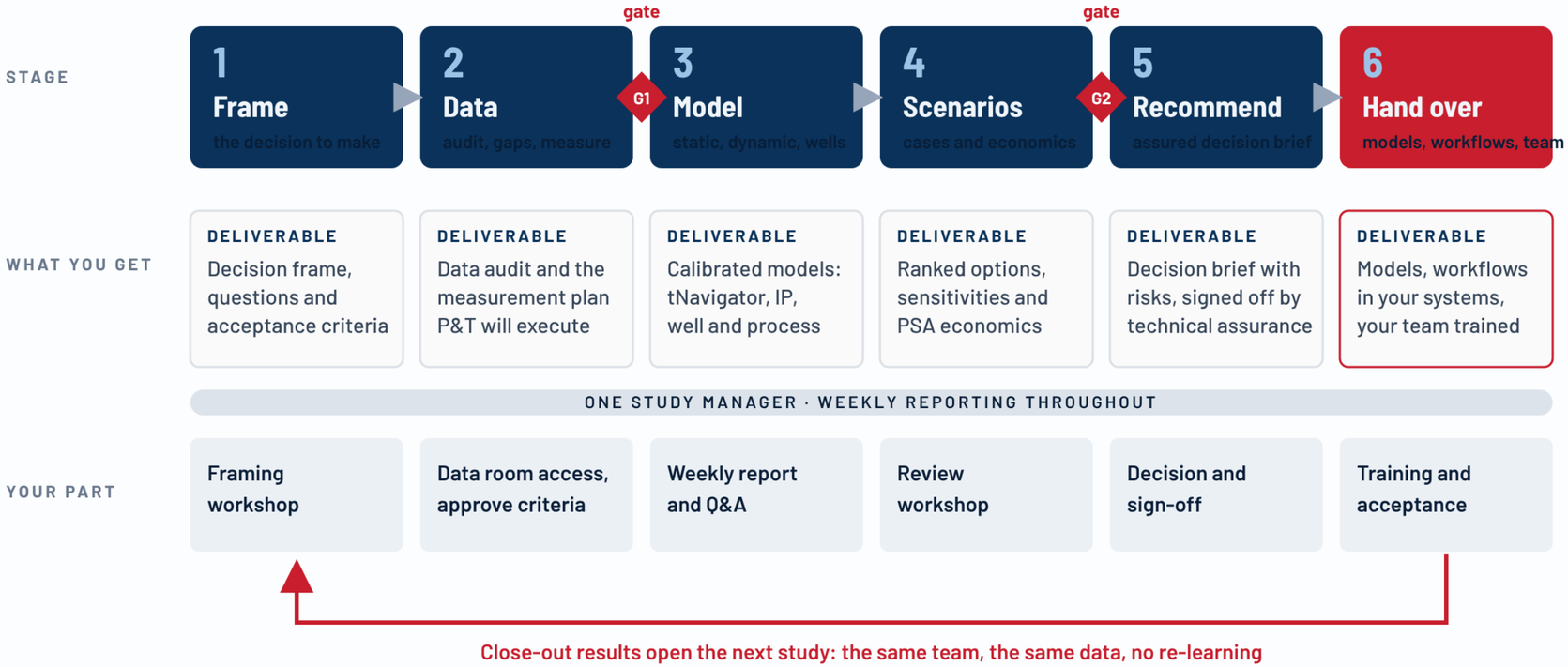
Technical review

An independent second opinion before a decision.

Contact the CISS team: CISS@slsog.com

STREAMLINE 02 · CISS

A CISS Study, Start to Finish



Two gates where you decide to proceed, re-frame or stop; one study manager and weekly reporting throughout; and nothing stays with us: models, workflows and a trained team are handed over.

ENGINEERING CAPABILITIES · HOW STUDIES ARE DELIVERED

Acceptance Criteria by Study Type

The quality bars we sign up to before work begins: representative acceptance criteria per study family, agreed and tailored at framing.

STUDY TYPE	CRITERIA	WHAT IT MEANS
Petrophysics / CPI	**Core-calibrated · full parameter set**	Porosity and Sw reconciled to core and pressures; documented cut-offs; CPI and digital curves for every well.
Static modelling	**±10% volumetrics · sim-ready**	Initialization within ±10% of model volumetrics; upscaling audits; full parameter documentation.
Simulation & forecasting	**±10% history match · ranked uncertainty**	Pressure and rate match conditioned on data quality; tuned parameters presented; tornado-ranked drivers.
Well & network (IPM)	**±15% match · unloading-proven**	Field matching per model; gas-lift designs simulated through unloading; optimization verified system-wide.
Reserves & CPR	**PRMS-strict · audit-traceable**	Classification per SPE-PRMS; dual-method validation; workpapers traceable end to end.
HSSE assessments	**Site-verified · closeable actions**	Findings verified in the field; recommendations written to be closed; close-out criteria defined at issue.

These are floors, not ceilings: criteria are tuned to your data at framing, written into the contract and reported against weekly.

ENGINEERING CAPABILITIES · HOW STUDIES ARE DELIVERED

QA/QC and Technical Assurance Framework

The review machinery every engagement passes through, from first data load to release signature.

1. **Gate 1 · Framing review**
   Problem statement, data plan and acceptance criteria peer-reviewed before commercial commitment.
2. **Gate 2 · Data QC**
   Loaded data audited against sources; gaps logged with agreed treatments; baseline frozen and versioned.
3. **Gate 3 · Mid-study technical review**
   Methods, calibrations and interim results challenged by a reviewer outside the delivery team.
4. **Gate 4 · Discipline review (TA2)**
   The discipline technical authority reviews the product against standards and criteria.
5. **Gate 5 · Release sign-off (TA1)**
   An independent study-level authority signs the release, as part of the process.
6. **Gate 6 · Close-out & lessons**
   Delivery workshop; hand-over confirmed; lessons fed back into methods.

INDEPENDENCE, GUARANTEED

Reviewers are never graded on the schedule they review: assurance reports to quality, not to the project.

AUDITABLE ON REQUEST

Review records, competency files and corrective-action trails are kept under our ISO 9001 system, ready for client audits.

STREAMLINE 02 · CISS · BUSINESS CASE

Studies That Paid: Egyptian Cases

WHY IT PAYS

- Integrated dynamic modelling moved STOIIP by **~7 MMBO** against volumetrics and justified a new well (GUPCO, Nezzazat, EJP 2018).
- Desktop process simulation unlocked **~100 t/d of LPG** and relieved 56–88 t/d of plant capacity at Salam gas plant (Khalda, EJP 2016).
- Single-well lift optimisation: **+19.4% oil** on an offshore jet-pump well (PetroGulf Misr, Petroleum Research 2023).
- Scheme selection is worth **10–25 recovery points**: CO_2 WAG 57% vs 32% waterflood (AEB-3C); peripheral 44.7% vs five-spot 33.7% (Bahariya).

GAS-LIFT STUDIES, GULF OF SUEZ

Allocation studies on GUPCO platforms freed 5.5–19 MMscfd of lift gas and added 330–510 bopd with no new compression; deeper injection on selected wells added a further 1,700 bopd in the model (OTC-24703-MS; Cairo University 2018).

CASE HISTORIES · EGYPT FIRST

Where · when	What was done	Published result	Source
Egypt · Nezzazat, Gulf of Suez (GUPCO) · 2018	Integrated 3D dynamic model history-matched to RFT and PLT data with a 'Big Loop' uncertainty approach	**Dynamic STOIIP ≈ 7 MMBO above the volumetric figure; new well supported**	Egyptian J. Petroleum 27(4)
Egypt · Salam gas plant, Khalda · 2016	HYSYS study adding a de-ethaniser and de-butaniser for NGL stabilisation	**~100 t/d LPG; 56 t/d export-pipeline and 88 t/d dehydration-unit relief**	Egyptian J. Petroleum 25(3)
Egypt · offshore well GA-1A, PetroGulf Misr · 2023	PROSPER model of a water-oil jet pump; motive rate and pressure optimised	**Oil +19.43%; tubing roughness shown to cost 20–25% of liquids**	Petroleum Research 8(4)
Egypt · AEB-3C, Western Desert · 2018	Compositional simulation of CO_2 WAG against continuous injection with NPV sensitivities	**Recovery 32% at end of waterflood → up to 57% with CO_2 WAG**	Egyptian J. Petroleum 27(4)

Sources: Egyptian J. Petroleum 27(4):887–896; 25(3); 27(4):1195–1207; Petroleum Research 8(4):561–571; Scientific Reports 16 (2026); OTC-24703-MS; Mansour, Cairo University 2018

03

STREAMLINE 03

Software Solutions

Industry platforms implemented, integrated and trained: subsurface, petrophysics, well and production data, planning and economics, and well integrity.

01 **Software overview** — 1 slide →

02 **tNavigator** — 4 slides →

03 **Interactive Petrophysics** — 1 slide →

04 **Peloton** — 2 slides →

05 **Quorum** — 3 slides →

06 **WelliRS** — 2 slides →

07 **Software value & cases** — 1 slide →

STREAMLINE 03 · SOFTWARE

Five Platforms Across the Value Chain

Reservoir	Wells and logs	Operations data	Planning and economics	Well integrity
tNavigator Rock Flow Dynamics 16 integrated modules from seismic to surface network; GPU-accelerated simulation	**Interactive Petrophysics** Geoactive 27+ modules for multi-well log analysis, cased hole and machine learning	**Peloton** Peloton WellView, ProdView, RigView and LandView on one governed cloud platform	**Energy Suite** Quorum Software PetroVR, Val Nav, Planning Space, Enersight and Energy Components	**WelliRS** Wellbore Technology AI-driven well integrity and well management across the life cycle

Engaged one platform at a time, or as one connected software estate with a single delivery team.

STREAMLINE 03 · SOFTWARE · TNAVIGATOR

tNavigator

Purpose

- Developed by Rock Flow Dynamics, tNavigator is a comprehensive reservoir modelling and simulation platform used in the oil and gas industry for dynamic reservoir analysis.

Key features

- **Integrated workflows:** geological modelling, reservoir simulation and production forecasting in a single platform.
- **High performance:** advanced computational algorithms deliver fast and accurate simulations.
- **User-friendly interface:** intuitive tools for model building, visualization and analysis.

Applications

- Used by geoscientists and reservoir engineers to optimize field development plans, enhance recovery strategies and make decisions based on predictive modelling.

STREAMLINE 03 · SOFTWARE · TNAVIGATOR

tNavigator: Module Breakdown

1 Geology Designer

Data interpretation and static reservoir model building, integrating seismic, well-log and core data into high-fidelity geological frameworks.

2 Model Designer

Pre-processing and dynamic reservoir modelling workflows for a seamless transition from static to simulation-ready models.

3 PVT Designer

Gas and fluid laboratory experiment interpretation, for accurate fluid characterization in compositional and black-oil simulation.

4 Well Designer

Wellbore and multi-segment simulation workflows supporting complex completion architectures and inflow performance analysis.

5 Network Designer

Surface network modelling, visualization and performance analysis connecting reservoir deliverability to facility constraints.

6 AHM & Uncertainty

Automated history matching and uncertainty analysis delivering calibrated model ensembles and statistically robust forecasts.

STREAMLINE 03 · SOFTWARE · TNAVIGATOR

tNavigator Simulation Capabilities

SIMULATION ENGINE

At the heart of tNavigator is a high-performance simulation engine supporting black-oil, compositional and thermal reservoir modelling, optimized for speed and scalability and able to handle multi-million-cell models on standard hardware.

Parallel processing gives rapid turnaround on full-field runs, so iterative scenario analysis keeps pace with operational decisions.

THREE SIMULATION MODES

Black oil

Industry-standard fluid modelling for conventional reservoirs with empirical PVT correlations.

Compositional

Full equation-of-state modelling for gas condensates, volatile oils and EOR processes.

Thermal

Steam injection, SAGD and in-situ combustion modelling for heavy oil and oil sands assets.

3.1–3.2 · SUBSURFACE SOFTWARE

tNavigator and Interactive Petrophysics

ROCK FLOW DYNAMICS

tNavigator

Seismic interpretation and geology designer

PVT, well and network designers

Black-oil, compositional and thermal simulation

Assisted history matching and uncertainty

Surface-network coupling; CCUS and geothermal

We build, history-match and hand over full-field models, and migrate legacy decks with parity benchmarking.

GEOACTIVE

Interactive Petrophysics (IP)

Multi-well data load, QC and interpretation

Advanced formation evaluation and rock typing

Cased-hole, production-log and integrity analysis

Image analysis and geomechanics

Machine-learning prediction modules

Widely known by petrophysicists in Egypt, so teams are productive from day one.

STREAMLINE 03 · SOFTWARE · INTERACTIVE PETROPHYSICS

Well Logging and Integrity Analysis

Geoactive Interactive Petrophysics (IP)

Brings subsurface geoscience and petrophysical data together in one platform, so teams can organize, quality-control and interpret well data at scale.

Supports the full subsurface workflow: basic and advanced log interpretation, borehole imaging, production logging, well integrity assessment, geomechanics and mapping, with machine learning built in. Cost-effective, and most professionals in Egypt already know its core modules.

WelliRS

Well integrity is too critical to leave to chance. WelliRS is a wellbore integrity and risk management module that tracks well barriers, integrity events and remediation across the whole portfolio.

As regulatory scrutiny of well integrity grows, it gives asset teams a defensible, auditable record of barrier status and risk-mitigation actions for every well.

STREAMLINE 03 · SOFTWARE · PELOTON

Peloton

The platform integrates two primary solution areas.

Well data lifecycle

Manages data from well planning through drilling, completions and abandonment.

- **WellView:** tracks all changes and operations through the well's life cycle, from planning to abandonment.
- **SiteView:** manages site-specific data and operations.
- **RigView:** schedules and tracks rig activities.

Production data lifecycle

Handles production data capture, field operations, surveillance, hydrocarbon accounting and regulatory reporting.

- **ProdView:** interactive, visual production data management with reporting, graphing and mapping to analyze operations.
- **ProdView Go:** mobile field data capture and communications for field operations.

STREAMLINE 03 · SOFTWARE · PELOTON

Peloton Suite: Module Overview

RigView

Rig and well project scheduling for drilling, completions, workovers, servicing and abandonment, with real-time collaboration across multi-rig programmes.

WellView

Comprehensive well information management across the life cycle (planning, drilling, completion, testing and workovers) in one structured repository.

ProdView

Production data management and allocation that improves recording, verification, visualization and reporting: an audit-ready record of field performance.

Peloton Frac

Real-time fracturing data visualization and cloud storage for standardized treatment data, with QA/QC during operations and post-job analysis.

STREAMLINE 03 · SOFTWARE · QUORUM

Partnership with Quorum: Core Software (1/2)

Quorum Software provides software for the energy industry, specializing in hydrocarbon management, production optimization and operational planning.

Hydrocarbon management (Energy Components)

- Real-time well performance monitoring and testing
- Mobile field data capture and compliance tracking

Asset development & planning

- **PetroVR:** early-stage asset evaluation and Monte Carlo simulation; conventional, unconventional and CCS
- **Enersight:** late-stage planning, surface network modelling, scheduling, constraints and financial forecasting

Capital & well lifecycle

- AFE and budgeting software; spending tracking
- Connects geology, engineering and finance; automated drilling and completion scheduling

STREAMLINE 03 · SOFTWARE · QUORUM

Partnership with Quorum: Core Software (2/2)

Quorum Software provides software for the energy industry, specializing in hydrocarbon management, production optimization and operational planning.

Measurement & compliance (FLOWCAL)

- Validates and balances gas and liquid measurement data
- Compliance with API, AGA and GPA standards
- Fewer unaccounted losses and audit risks

Economics & reserves

- **Val Nav:** petroleum economics, reserves booking and type-curve analysis
- **Planning Space:** corporate strategy, tax modelling and financial planning

Production forecasting (Previso)

- Hydraulic modelling for gas and condensate systems
- Reservoirs and wells integrated for accurate forecasts

3.3–3.4 · OPERATIONS, PLANNING & ECONOMICS

Peloton and the Quorum Energy Suite

PELOTON

Well, production and land data

Application	Role
WellView	Every event in a well's life, plan to abandonment
RigView	Rig and well-work scheduling
ProdView	Production capture, allocation, reporting
SiteView · LandView	Sites, facilities and land records

QUORUM SOFTWARE

Planning, economics and accounting

Product	Role
PetroVR	Early-stage asset evaluation, Monte Carlo
Val Nav	Forecasting-to-economics, reserves booking, type curves
Planning Space	Corporate planning and fiscal modelling
Energy Components	Hydrocarbon accounting and allocation

One connected chain: Val Nav forecasts feed Enersight plans, plans reconcile in Planning Space, and produced volumes are accounted in Energy Components.

STREAMLINE 03 · SOFTWARE · WELLIRS

WelliRS

WelliRS is an integrated artificial-intelligence platform for well integrity management, connecting planning, drilling, well services, production and abandonment in one system.



Well integrity management

- Hybrid AI approach for planning, drilling, well services and production.
- Automated well-construction planning and real-time monitoring.
- Job planning, compliance and risk prediction optimized.

AI use cases

- Well failure prediction, reducing well and equipment downtime.
- Pressure-anomaly detection and trend prediction.
- Production optimization and scheduling.
- Cased-hole logging analysis.
- Automated drilling data extraction.
- AI-driven flow-assurance recommendations for operations, chemical dosing and maintenance.

3.5 · WELL INTEGRITY SOFTWARE AND DELIVERY

WelliRS and How We Implement Software

WELLBORE TECHNOLOGY

WelliRS

An AI-driven well management system connecting planning, drilling, well services, production and abandonment.

Barrier register and integrity events

Failure and pressure-anomaly prediction

Job planning and compliance tracking

Cased-hole log analysis

Cloud or on-premise deployment

HOW WE DELIVER EVERY PLATFORM

1. Selection and licensing
2. Data migration and QC
3. Workflows configured to your standards
4. Integration with your systems, e.g. SAP work orders
5. Classroom and on-the-job training
6. Local support and maintenance renewals

STREAMLINE 03 · SOFTWARE · BUSINESS CASE

Software: Value and Cases

WHY IT PAYS

- Ensemble workflows replace a single deterministic match: **500 realisations narrowed to 18** history-consistent models before committing eleven wells (Apache Egypt JV with RFD, SPE-223239-MS).
- Speed: tNavigator **up to 10× faster** than a legacy thermal simulator across ~35 models; GPU geostatistics more than 4× (RFD).
- Planning on one platform cut planning FTE by **~60%** and turned re-cycles into hours at a supermajor (Quorum Planning Space).
- Integrity analytics flagged **three developing sustained-annulus-pressure wells** that manual review missed; intervention reports from a week to hours (Wellbore Technology).

WHY A SYSTEM OF RECORD

30–45% of active wells worldwide carry some integrity issue (Yakoot et al., GUPCO and Suez University, 2021); reserves, planning and integrity data belong in auditable systems, not spreadsheets.

CASE HISTORIES · EGYPT FIRST

Where · when	What was done	Published result	Source
Egypt · Apache Egypt JV / Khalda with RFD · 2024	Stochastic field development in a data-starved reservoir; DCT-based assisted history matching	**500 → 18 matched models; six producers and five injectors optimised; run on workstations**	SPE-223239-MS; SPE-222492-MS
Egypt · Ashrafi field, Gulf of Suez · 2018	Core and log evaluation of the Kareem sandstone in Interactive Petrophysics	**Net pay 17–110 ft, porosity 13–26%, permeability 125–960 mD; core–log correlation 0.81–0.85**	Egyptian J. Petroleum 27(4)
UAE · ADNOC Onshore giant carbonate · 2019	Assisted history matching and uncertainty in tNavigator: 17 parameters, 260 global runs	**Calculation time reduced; a ranged forecast replaced the single match**	SPE-196729-MS
Canada · Saturn Oil & Gas · current	Reserves valuation and AFE execution on Val Nav and Quorum Execute through acquisitions	**200 → 40,000 boe/d in four years on the same platform and team**	Quorum case study

Peloton and WelliRS publish no named Egyptian cases; both are presented here as capability, with references available on request.

Sources: SPE-223239-MS; SPE-222492-MS; SPE-196729-MS; RFD (2026); Egyptian J. Petroleum 27(4):1013–1027; Quorum case studies; Wellbore Technology; Yakoot et al., JPEPT 2021

04

STREAMLINE 04

Training & Development

Competency built across upstream and downstream, linked to the technologies we deliver.

01 Upstream catalogue →

02 Downstream programme →

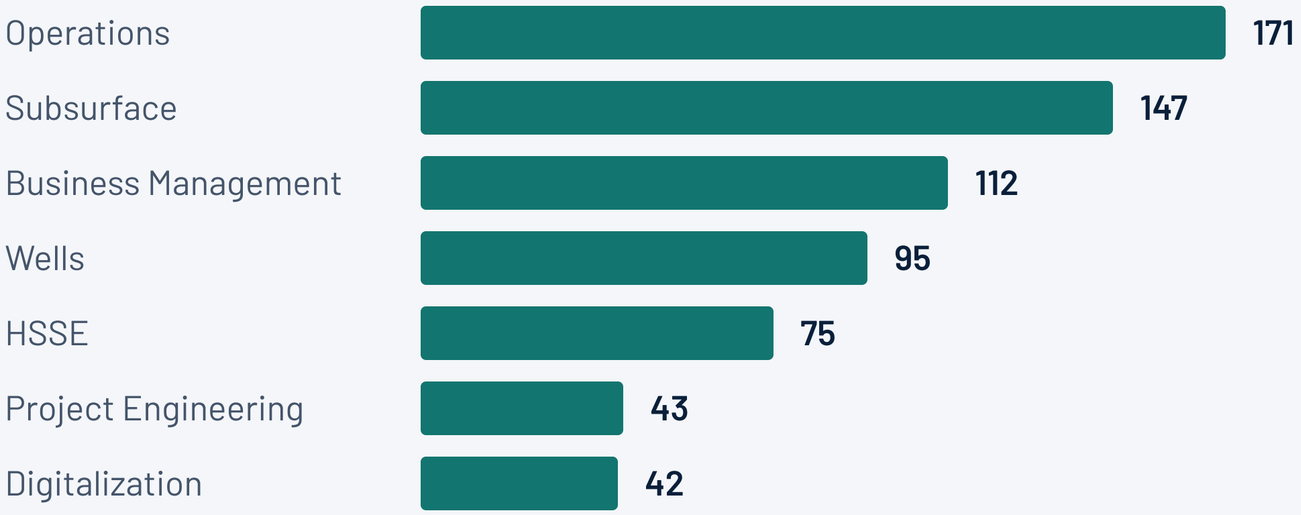
03 How training is delivered →

04 Value and cases →

STREAMLINE 04 · TRAINING

Learning & Development Catalogue 2026–27

COURSES BY DEPARTMENT



Total 685 courses across 35 disciplines.

Every course listing gives

Day-by-day outline and objectives
Target audience and eligibility
Duration, venue and level
Manual, worked examples, certificate

Competency levels

Knowledge · Skillful · Master, with competency and gap assessments to place each trainee.

STREAMLINE 04 · TRAINING

Downstream Programme and Training Formats

DOWNSTREAM CATALOGUE: 500 COURSES, 19 DISCIPLINES

Department	Disciplines and coverage
Operations 355 courses · 14 disciplines	Refinery process technology, gas processing, process safety, process facilities, production operations and chemistry, maintenance and reliability, automation and control, instrumentation, energy efficiency, CCUS, logistics
Project Engineering 145 courses · 8 disciplines	Civil and structural, electrical, mechanical, materials and integrity, process simulation and design, rotating equipment, instrumentation and control
Levels	62 Knowledge · 314 Skillful · 124 Master; 43 courses shared with the L&D calendar
Delivery	On request at your premises, our Cairo training centre or a hotel venue; priced per participant and per programme

FORMATS

- Instructor-led classroom
- Certified, e.g. NEBOSH IGC
- Software training on our platforms
- Workshops and fast-track studies
- On-the-job training on the equipment
- Multi-week programmes

STREAMLINE 04 · TRAINING

How Training Is Delivered

1 · ASSESS
Competency and gap assessment of the team

→

2 · DESIGN
Programme built from the catalogue or tailored

→

3 · DELIVER
At your premises or a Streamlines venue

→

4 · CERTIFY
Scored assessment, manual and certificate

For corporate partners

Volume discounts, and complimentary places for organisations that run their programmes through Streamlines.

Linked to our technologies

Operators and engineers trained on the equipment, chemistry and software we deliver, on their own wells where possible.

One standard offer

Every course is offered in a standard five-page technical offer: overview, agenda, assessment, contacts.

training@slsog.com · www.streamlines-training.com

STREAMLINE 04 · TRAINING · BUSINESS CASE

Training: Why It Pays

WHY IT PAYS

- Top-quartile engagement against bottom-quartile: **+23% profitability, +18% productivity, –63% safety incidents** and 21–51% lower turnover across 183,806 business units (Gallup Q12 meta-analysis, 2024).
- **59 of every 100 workers** will need training by 2030; 39% of current skills change by then; 85% of employers plan to prioritise upskilling (WEF Future of Jobs 2025).
- **63% of employers** name skills gaps as the main barrier to transformation (WEF 2025).
- Competency-based design, not generic courses: IOGP guidance for well-control and source-control competency sets the benchmark our programmes follow.

WHAT THIS MEANS FOR A JV

Every Streamlines course ends in a scored assessment and a certificate, and the same trainers deliver on the equipment, chemistry and software we supply, so the capability stays with your team after the contract ends.

CASE HISTORIES · EGYPT FIRST

Where · when	What was done	Published result	Source
Global · Gallup Q12 meta-analysis · 2024	347 organisations, 3.35 million employees: outcomes compared between top- and bottom-quartile engaged units	**+23% profitability; +14% production records; –63% safety incidents; –21% to –51% turnover**	Gallup, 2024
Global · WEF Future of Jobs · 2025	1,000+ employers, 14 million workers, 55 economies surveyed on skills and reskilling needs	**59% of workers need training by 2030; 85% of employers prioritise upskilling**	WEF, 2025
Industry · IOGP Reports 668 and 591 · 2021–23	Meta-analysis of gamified well-control training; subsea source-control competency guidance	**Small-to-moderate positive effects on knowledge, motivation and behaviour; competency frameworks defined**	IOGP

Sources: Gallup Q12 Meta-Analysis 11th ed. (2024); WEF Future of Jobs Report 2025; IOGP Report 668 (2023) and IOGP–IPIECA Report 591 (2021)

PARTNERS · ENGAGEMENT · CONTACTS

Working with Us

Technology partners, how we engage, where to start by asset type, and who to call.

01 Technology partners →
02 How we engage →
03 Where to start →
04 Why Streamlines →
05 Summary →
06 Contact →

WORKING WITH US

Technology Partners and Principals

Rock Flow Dynamics
tNavigator reservoir simulation

Geoactive
Interactive Petrophysics

Peloton
Well and production data platform

Quorum Software
Planning, economics and reserves suite

Wellbore Technology
WelliRS well integrity system

United Lift Technologies
Plunger and rod lift; Egypt representative

SNF
EOR and conformance polymers; authorised reseller

Quartz
Production chemicals

OWN TECHNOLOGY

Surge Disk
Streamlines-owned perforation surge system

Eclipse Well Services
Rigless intervention, packers, velocity strings

Partner technologies carry their principal's engineering behind ours; Surge Disk is our own. All are supported locally by the Streamlines team in Cairo.

WORKING WITH US

How We Engage

1
Supply & commission
Equipment sized, delivered and commissioned, with training and a spares plan.

2
Rental & service
Metering, logging, testing and intervention run by our crews, campaign by campaign.

3
Pilots & programmes
Chemical, EOR and completion technologies proven on your wells first, with gates you set.

4
Integrated campaigns
Diagnose, fix and prove on one problem, with one point of accountability.

5
Technical review
A second opinion on an inherited programme, a diagnosis or a capital decision.

COMMERCIAL FORMS — Integrated monthly service with a capped fee · call-off against agreed unit rates · campaign-based mobilisation · fixed-scope studies

Every engagement starts with agreed acceptance criteria and a measured baseline.

WORKING WITH US

Where to Start, by Asset Type

Asset situation	First engagement we would propose
Mature gas, liquid-loaded wells	Deliquification study, then plunger lift or velocity strings
Gas-lifted oil fields	Clamp-on injection survey, gas-lift design review and SST
Waterfloods, high water cut	Injection surveys and a reservoir study, then a conformance or AICV pilot
Large onshore well stocks	Well integrity programme: WIT campaigns, MAASP, WelliRS records
Rod-pump and PCP fields	Echometer surveys, long-stroke units and automation, wellhead integrity
Offshore platforms	Multiphase well testing and offshore integrity campaigns
Planning and reserves teams	Reserves classification, PetroVR planning, portfolio and rig scheduling
Refineries and gas plants	Process simulation studies, H_2S programmes, downstream training

One accountable partner, from the first measurement to a trained team.

Principal-backed

Manufacturers' engineering behind every technology

Evidence-led

Acceptance criteria and baselines agreed up front

Local bench

Engineers and support based in Cairo

Capability transfer

Training alongside every technology we deliver

SUMMARY

Five Things to Take Away

1 **Four streamlines, one accountable agreement**
Field technology, studies, software and training delivered by one Cairo team, under one contract.

2 **Measure first, then act**
Surveillance, diagnostics and testing define the candidate before anything is pumped, installed or stimulated.

3 **Rigless first, with published evidence**
Every technology carries its business case and case histories: Gulf of Suez and Western Desert where they exist, the Gulf and worldwide where they do not yet.

4 **Our own technology and our principals'**
Surge Disk is Streamlines-owned; the rest is delivered with the manufacturer's engineering behind ours.

5 **Nothing stays with us**
Models, records and procedures are handed over in your systems, and your team is trained to run them.

WHAT WE ASK

Name one asset and one problem. Within two weeks we return a first-engagement proposal with scope, acceptance criteria and a baseline, priced in one of the five commercial forms.

THE FIRST ENGAGEMENT IS USUALLY

A well-integrity or gas-lift survey campaign · a deliquification or water-control study with a pilot gate · a software licence with implementation and training · a technical review of an inherited programme

Eng. Mohamed Zahran · Development & Growth Manager · Mohamed.Zahran@slsog.com · +20 128 519 9666

STREAMLINES

We Create the Stream

Tell us which asset, problem or team you want to start with, and we will propose the first engagement.

CONTACT

Eng. Mohamed Zahran

Development & Growth Manager

Mohamed.Zahran@slsog.com · +20 128 519 9666

STREAMLINES ENERGY

9235/8 Adly Elmeligy St., El Mokattam, Cairo 11571, Egypt

+20 2 2836 3282 · www.slsog.com

CISS@slsog.com · training@slsog.com