Advanced Completions and Production Optimisation
Advanced Completions & Production Optimisation for our Clients’ Reservoirs

Tendeka was established in 2009 through the consolidation of SwellFix, Sensornet and Well Technology. Strategic acquisitions of Flotech and FloQuest in the same year saw Tendeka emerge as a leading provider of completions systems and services to the upstream oil and gas industry.

With a global presence, Tendeka continues to expand its reach, develop technology and increase capability across all reservoirs. Our clients have experienced improvements in completions performance by combining field proven technologies with innovative design. Such advancements include Autonomous Inflow Control Device (AICD) technology; wireless intelligent completion technology which contributes to the overall digital oilfield vision, and unique technology for enhancing life of water injections wells.

From simple to complex well designs, our systems have extensive track record to overcome production challenges in the most challenging operating environments.

Our commitment to developing innovative and quality technologies enables our clients to maximise production across the full spectrum of conventional and unconventional reservoirs.

With main headquarters in Aberdeen, UK, we have further offices and operations in our regions of Europe, Former Soviet Union & Sub-Saharan Africa; Middle East & North Africa; North and South America, and Asia Pacific & China. Our global presence ensures we are well placed to meet demands and deliver measurable results to our clients, no matter where they are.

Tendeka Timeline

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<td>Flotech 2002 Sand Face Completion</td>
<td>Research &amp; Development</td>
<td>Tendeka Today Advanced completions and production optimization technology for the global oil and gas industry</td>
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<td>FloQuest 1998 Data Interpretation</td>
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**Strategy, Vision & Mission**

We deliver returns and create value for our clients by providing high quality completions and well services, and significantly improve well performance through utilisation of global footprint and extensive routes to market.

We strive to accelerate innovation and commercialisation of new technology, bringing impactful solutions to our clients across the globe.

**Mission:** to be the advanced technology company that optimises reservoir recovery through innovation and employee empowerment.

**Vision:** to optimise every drop of energy produced from the planet

**Significant Milestones**

Tendeka's portfolio includes completion solutions for zonal isolation, sand and inflow control, hydraulic fracturing, wireless completions, data visualisation, production enhancement and reservoir monitoring. Operating in conventional and unconventional reservoirs, the track record speaks for itself with over 100,000 installations worldwide.

Tendeka's significant milestones include:

- installation of the world's first wireless intelligent completion
- award of the largest sand control contract in the world
- recognition as market leader in inflow control technology with installations across 5 continents
- launch of Production Enhancement division delivering significant water savings in hydraulically fractured completions
Core Values

**SAFETY**
We are committed to the wellbeing of our people, contractors and visitors, the wellbeing of the environment and the achievement of zero incidents.

**PEOPLE**
We are culturally diverse and aware, our people respect each other, learn together and work together to deliver our organisation’s goals together. We are open in our communication and promote awareness of our performance and plans across the organisation.

**PERFORMANCE**
We are exceptionally focused and dynamic, we strive to deliver excellent results whether safety, environmental, operational, financial or strategic through effective leadership and teamwork. We set clear expectations and foster a culture of continuous improvement and learning to achieve our goals.

**INTEGRITY**
We are highly ethical, trustworthy, respectful and reliable in all that we do. We are accountable and responsible for our actions and honour and deliver upon our commitments.

**INNOVATION**
We are creative, and driven to continuously enhance and adapt our operations, technology and processes to better serve our clients in the global conventional and unconventional sectors.
Global Operations

NORTH & SOUTH AMERICA

EUROPE, FSU & SUB-SAHARAN AFRICA

MIDDLE EAST & NORTH AFRICA

ASIA PACIFIC & CHINA

Regional HQ

Operations / Sales Office

Warehouses / Manufacturing

External Representation

Track Record

Sand Control

Inflow Control

Zonal Isolation

Hydraulic Fracturing

Wireless Completions

Reservoir Monitoring

Subsurface Engineering

Production Enhancement

- Over 1 million ft of sand screens installed
- +7,000 passive ICDs and +28,000 AICDs
- 65,000 swellable packers installed
- Fracturing system developed in-house for integration with fibre optic monitoring
- World's first wireless intelligent completions launched & deployed
- Over 250 installations of fibre optic, permanent and electronic gauge monitoring
- +100,000 installations globally
- Production enhancement technologies and fluid field service support
Sand Control

Tendeka is recognised as a leading provider of sand face completions, delivering innovative solutions to enhance well performance and maximise hydrocarbon recovery.

Our portfolio of sand face completion technologies includes the industry leading Autonomous Inflow Control Device (AICD), the most robust, premium screen offering, and swellable packer technology with a track record going back over 15 years.

The portfolio is constantly expanding to provide integrated completions solutions for sandstone and carbonate reservoirs, light and heavy oil, production and injection applications, and greenfield and brownfield developments.

Sand Control Screens

Tendeka manufactures and supplies premium metal mesh and direct wrap sand screens. Our screens can be configured for deployment standalone, integral to a gravel pack, or be combined with inflow control technology. All Tendeka screens are designed, manufactured and fully qualified to meet ISO 17824 V1 standard, and have undergone rigorous testing.

FloMax

The FloMax sand control screen offers the ultimate in sand retention and fines tolerance. The premium design features a five-layer metal mesh filtration system for support, drainage, filtration, convergence and protection. Innovative pressure-fit assembly ensures the premium mesh layers achieve the highest burst and collapse rating, and result in a mechanically robust screen. This can be mechanically handled at surface, and deployed through milled windows and tight doglegs downhole.
FloDirect range
Tendeka’s direct wire wrap screens are available in both conventional slip-on and wrap-on-pipe variations. Jackets are available in standard service 316LSS or CRA alloy as required. Wire profiles are available with a heavy-duty design for maximum erosion resistance.

Wrapped screens are shrink fitted to the perforated base pipe, providing maximum strength to withstand high loads in shear, compaction and torque. Internal control of wire quality and specifications ensures maximum plugging resistance.

Tendeka Sand Control Benefits
- State-of-the-art weaving technology
- High inflow with maximum plugging resistance
- Range of types to suit well characteristics
- High burst and collapse ratings
- No moving mechanical or electrical parts

OVER 1,000,000 FT OF SAND SCREENS INSTALLED
Floright ICD

Inflow Control Device (ICD) technology is applied to enable the effective management of reservoir sweep in horizontal wells. Long horizontal wells can increase productivity and recovery of oil by increasing reservoir contact. However, uneven production due to reservoir heterogeneity, fractures or frictional pressure losses along the length of the horizontal bore can lead to early water or gas breakthrough. ICDs located along the length of the horizontal wellbore apply an engineered pressure drop to manage inflow of fluids into the completion, thereby mitigating these problems.

ICD technology has been successfully applied in both sandstone and carbonate reservoirs.

Tendeka provides a wide range of fully interchangeable field adjustable nozzle-based ICDs which are engineered for a wide range of applications. They are integrated into the lower completion either with sand screens, or within short subs for non-sanding applications.

Tendeka’s FloRight™ ULTRA screen range can be supplied with FloCheck™ ICD valves, removing the requirement for an inner wash string whilst retaining the capability to circulate and spot fluids through the liner or screens.

FloSure AICD

The FloSure Autonomous Inflow Control Device (AICD) is an effective solution for increasing oil production over the life of the field. The award-winning FloSure™ AICD has been deployed successfully in light and heavy oil applications to overcome water or gas breakthrough and ensure uniform production longevity. The device preferentially chokes unwanted produced fluids whilst promoting production of oil from the entire length of the well.

Tendeka is the industry leader in AICD technology, and has installed in new wells and retrofit applications for gas and water control.

Inflow Control Range

As well as the FloRight ICD and FloSure AICD technology, Tendeka has developed a range of inflow control solutions to suit numerous downhole conditions, including:

- **Steam Injection AICD**: improves steam distribution along the full length of the injection well and reduces steam circulation times during start-up in Steam Assisted Gravity Drainage (SAGD) projects. The improved heat distribution to the end of the injection well enhances steam chamber growth and promotes a more uniform sub-cool temperature profile, reducing early steam breakthrough in the production well. The result is more efficient bitumen recovery and a reduction in steam generation costs.

- **Bypass Valve (BPV)**: deployed in the same housing as an ICD or AICD to enable efficient chemical treatments.

- **Dual Choke Valve (DCV)**: allows effective placement of chemical treatments in producer wells, without restricting production, and effective clean-up of water injector wells without restricting injection.

- **FloExtreme**: limits the erosion effects in high rate / higher pressure drop applications such as water injection wells and low permeability producers, e.g. carbonates or heavy oil.

All of these devices have the same geometry ensuring simple change out and flexibility in designing screen completions.
The Complete System

From the liner hanger to the shoe, Tendeka provides a complete service in the design and installation of sand-face completions. We have the ability and flexibility to custom-design solutions to meet each application challenge across the existing technology range and through the effective development and integration of new functionalities.

“Sometimes the simplest inventions are the best. The AICD makes oil production much more efficient - with the help of a simple mechanism.”

Production Technology Manager, Operator

FloSure™ AICD Flow Performance v Passive ICD or AICD Valve

<table>
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<tr>
<th>Pressure Drop (bar)</th>
<th>Flow rate (rbbl/d/AICD) - Reservoir Conditions</th>
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<td>0</td>
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<td>5</td>
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Key

AICD
- Water
- Oil
- Gas

PASSIVE ICD
- Water
- Oil
- Gas

AICD shows same oil rate but less water
Zonal Isolation

Effective open-hole zonal isolation provides well compartmentalisation critical for inflow control, intelligent completions and effective well stimulation.

Tendeka is a pioneer of swellable elastomer technology where our SwellFix and SwellRight packers continue to lead the field. Swellable packers are activated when in contact with water and/or oil to provide a cost-effective, low risk, simple-to-install zonal isolation solution. Our patented swelling elastomers have been tested to 10,000psi and 250°C, and are compatible with acid, H2S and gas. Packers are available in slip-on designs for efficient well compartmentalisation or bonded directly on pipe for when higher pressure differentials are required.

Our SealRight range of field proven hydraulic set open hole packers are available for when immediate zonal isolation is required.

65,000 SWELLABLE PACKERS INSTALLED
The drive to produce hydrocarbons from layered formations such as laminated shales and inter-bedded lithologies has led to a sharp rise in the number of wells requiring multi-stage hydraulic stimulation.

Tendeka’s FracRight system helps operators ensure stimulation jobs are cost-effective by fracturing the maximum number of zones in a single trip.

Designed for reliability, FracRight sleeves incorporate Tendeka’s rigorously tested ball seat technology for improved sealing performance under all downhole conditions.

**FracRight plugs**

Tendeka provides credible frac plug solutions to achieve optimal deployment and drilling or dissolution times, whilst ensuring dependable setting, and pressure holding capabilities for the duration of your operation. Tendeka’s FracRight plugs are designed to be milled quickly and easily, maximising operational efficiency and increasing overall economics:

- FracRight Composite Plug
- FracRight Dissolvable Plug
- FracRight Big Bore Frac Plug

**FracRight Multi-Stage System Overview**

**FracRight Products & Services**

Tendeka’s range of fracturing tools ensures well integrity throughout the entire life of the well, while also reducing total well life-cycle costs. The range of tools includes:

- ISO V3 qualified liner hangers
- open hole packers
- composite and dissolvable frac plugs
- remotely activated toe sleeves for cemented and uncemented applications

**Production Enhancement**

Tendeka innovates, manufactures and supplies a full suite of fracturing, acidizing and EOR technologies to help E&P companies extract every drop of oil from their reservoirs.

Our MajiFrac Solutions help E&P companies reduce the intensive water and time requirements needed to complete their unconventional wells. Along with offering production enhancement technology, Tendeka provides fluid field service support for E&P companies.
PulseEight Wireless Intelligent Completions

Since the early 2000s, intelligent completions have been used extensively for improved exploitation of hydrocarbon resources through shut-off of unwanted production, improved water injection placement and modification to inflow profiles to increase recovery factors. They form an integral part of many development strategies for both extending the life of existing fields and the development of new fields.

Traditionally the intelligent completion is monitored and controlled from surface using multiple hydraulic and/or electric control lines which must pass through the wellhead into the completion annulus, along the length of the upper completion, through any packers, and into the reservoir section where the interval control valves (ICVs) and downhole gauges are located. While this technology has been used with great success, there are a number of limitations associated with the use of control lines, which increase capex and opex, weaken well integrity and limit the functionality of the intelligent completion.

PulseEight eliminates control lines, making it simpler and quicker to install. It reduces feedthroughs for better barrier integrity, and allows intelligent completions in more complex and multi-lateral wells.
Distributed Temperature Sensing (DTS) allows you to continuously obtain measurements in real-time along the entire length of your wellbore. The Guardian range by Tendeka leads the way in terms of performance in DTS technology, the fastest measurement speeds available and the greatest coverage of up to 50km from a single channel. Based on analysis of Raman Backscatter signals in an optical fibre, DTS systems use a combination of variations in backscattered light intensity and time domain reflectometry to create temperature against distance profiles. The fibre acts as both a sensing element and transmission medium.

Tendeka has successfully installed over 250 fibre optic installations around the world and have been a pioneer in developing methods to use this technology to optimise reservoir productivity.
Tendeka’s Subsurface Engineering Team are a globally deployed group of petroleum engineers and software developers focused on well performance monitoring solutions.

Our highly experienced team engages with our customers’ asset teams, developing an understanding of their reservoirs, their development challenges, and their performance metrics. We have an in-depth understanding of the advanced well completion technologies available and their applications, and how they can be used to optimise the client’s reservoir model.

**Data Analysis and Visualisation**

Data analysis and visualisation is provided through Tendeka’s FloQuest software range. FloQuest is an extremely powerful, user-friendly Windows application for interfacing with production sensor data. The application allows the wellbore to be accurately defined, modelled and matched using distributed and point sensors all the way from the sand face to the wellhead. Its multi-phase modelling capability and flow allocation algorithms are used to perform real-time zonal virtual flow metering and automated event detection.

**Well Performance Modelling & Optimisation**

NODAL analysis and well flow performance modelling is performed using NETool™, with domain expertise in advanced completion modelling. This includes wellbore segmentation and flow control using ICDs, AICDs and intelligent completions in wells with advanced architecture (horizontal and multi-lateral wells). Such analysis and modelling are used to evaluate the proposition of the advanced completion and monitoring technologies identified.

**Reservoir Dynamic Modelling**

Dynamic reservoir simulation with both sector and full field models using ECLIPSE™ Industry Reference Reservoir Simulator, with domain expertise in advanced completion dynamic modelling in complex reservoirs. Simulation and analysis can include uncertainty analysis and risk evaluation through multi-scenario modelling.
Investing in Innovation

Digital Oilfield
Tendeka’s Digital Well Management Solutions use advanced downhole hardware, including wireless intelligent completion technology; proprietary software providing data analysis, visualisation, control and automation functions; and surface systems to enable collaboration and interface either via existing digital oilfield systems or through standalone cloud-based solutions.

Fundamental to achieving the full potential of intelligent completions is the integration with digital oilfield capabilities.

The Digital Oilfield concept can be described as the application of software, hardware and data analysis techniques to increase productivity and efficiency of oil and gas production. In effect, it is the use of remote operational monitoring, alert driven surveillance by exception and virtual collaboration to provide the link between people, processes and technology to deliver real-time optimisation.

Digital Oilfield technology has been in development over the past decades and today can encompass entire oilfield assets, addressing complex challenges in data integration, systems architecture and cultural barriers.

R&D / Manufacturing
Tendeka is a market leader in offering alternative solutions to the completions market, and ensures its cost-effective and scalable manufacturing model provides a competitive advantage, delivering a quick turnaround of orders for clients. To meet customer demand, Tendeka has suppliers, manufacturing plants and product warehouses in key global locations.

Tendeka has an R&D facility in Aberdeen, UK, which focuses on supporting all of our Completion Technology product lines. It houses a polymer development laboratory to support ongoing Swellable research, as well the ability to manufacture small batches of swellables for R&D testing. The facility also has Pressure and Temperature testing capabilities to support all aspects of the development process, while also housing a firmware and electronics research laboratory.
RESULTS ACROSS YOUR RESERVOIR