

ben **TTC** IOS

Drilling Integrity & Optimization Systems



Never Stop Innovating



Never stop innovating

At Bentec, we're proud to be one of the world's leading manufacturers of drilling rigs. Alongside our high quality rigs, our portfolio includes world-class mechanical and electrical equipment and systems.

Now we have brought our years of experience and expertise to bear in BentecIOS (Integrity & Optimization Systems) – our superb range of intelligent software applications and solutions, all designed to deliver optimized drilling performance on demand.

Used in combination with existing Bentec equipment or other existing hardware, BentecIOS is proven to maximize rig and equipment uptime, increase safety, improve ROP and can offer earlier well delivery.

Let us show you how BentecIOS can enhance your drilling operations.

BENTEC SOLUTIONS – MADE IN GERMANY

- ▶ Design and manufacture of drilling rigs for worldwide use
- ▶ Manufacture of mechanical and electrical main equipment and systems
- ▶ After sales service
- ▶ Service, repair and overhaul
- ▶ Spare parts supply and logistics
- ▶ Upgrades
- ▶ Recertification
- ▶ System integration and commissioning
- ▶ Global project management
- ▶ Bentec Power Technologies

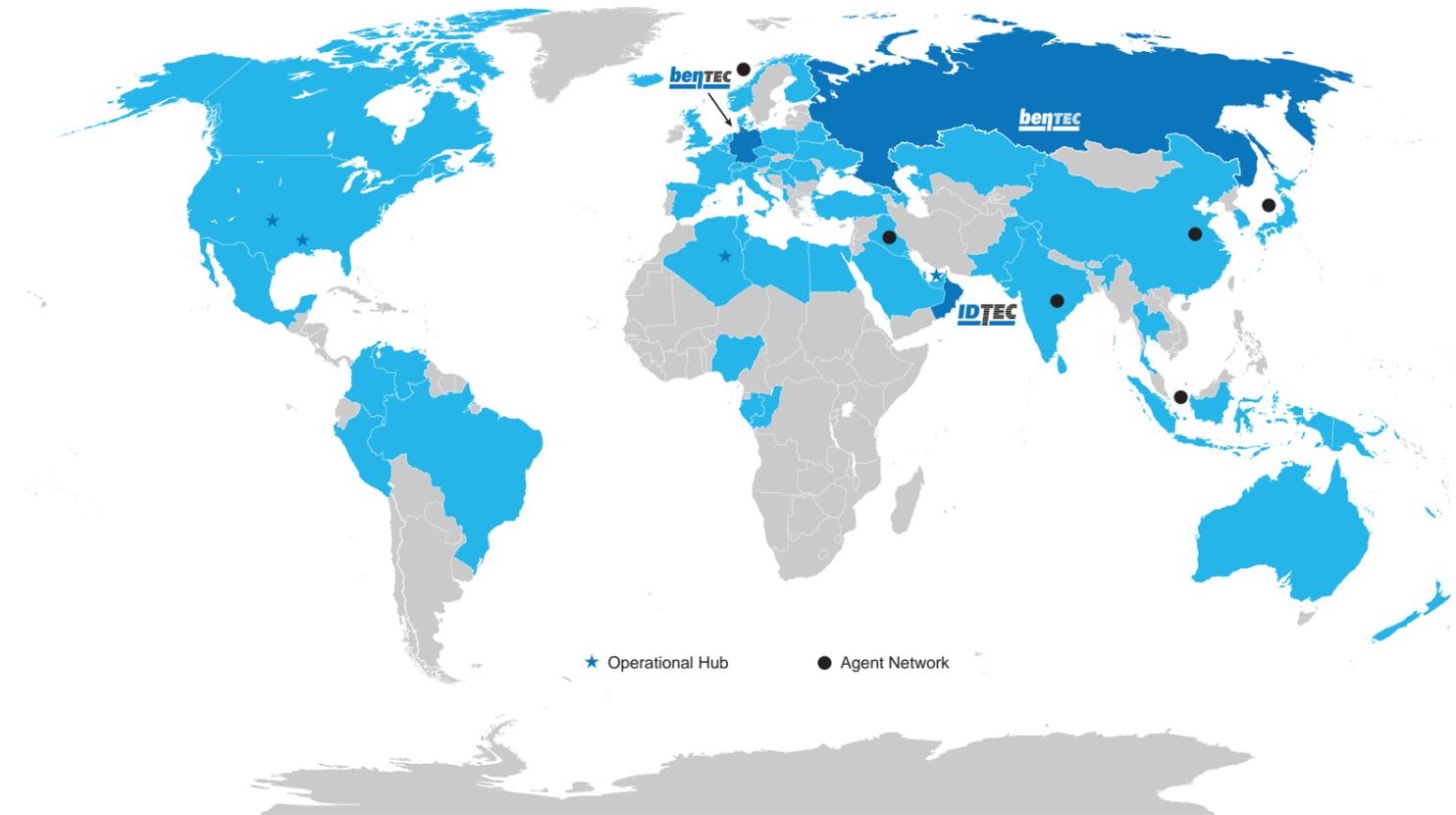
BENTEC HEADQUARTERS AND SUBSIDIARIES

Bentec is headquartered in Bad Bentheim, Germany, where we maintain production facilities of more than 100.000m², including our Training Centre. Additionally, we have production and service facilities in Tyumen, Russia and Nizwa, Sultanate of Oman. Furthermore, we have a wide range of operational hubs in North America, Algeria and United Arab Emirates, as well as an extensive agent network.

PROVEN AROUND THE WORLD

Bentec designs, manufactures and delivers reliable, safe and efficient rigs and equipment for oil, gas and geothermal drilling in the harshest and most hostile environments around the world. By combining these prime solutions with extensive services ranging from 24/7 field support, to a sophisticated training offering, we are a true vertically integrated system provider.

Everything we do is orientated to our core values, above all to our strict health, safety and environmental (HSE) policies.





Real-time drilling data for a full overview of your rig

The Bentec infoDRILL is a superb, responsive drilling information system. It provides fast and accurate information in changing conditions, enabling measures to be taken by operators, quickly and efficiently.

The simple and intuitive drillers user interface provides drilling data indication and hard disk recording, for clarity and control. All drilling instrumentation data are accessible in the drillers control room or by other rig personnel via remote client access.

All settings like alarm points, scaling, zoom etc. can be performed without use of a keyboard for ease of use, while different screen layouts for drilling and tripping for example, provide just the relevant information at any given time, ensuring simplicity. Languages and measurement units are adjustable at any time.

EASY TO USE. EASY TO CONNECT.

infoDRILL is equipped with various features like WITS Level 0 and WITSML interface, for forwarding drilling data to external systems and provides additional IDAC based daily drilling reports and an electronic pipe tally.

The basic configuration offers two 19" LCD-monitors, situated in the drillers control room. A single cable connects the raid 1 data server inside the system cubicle and the LCD panel in the drillers cabin. This simple configuration contributes to faster rig moves of land drilling rigs.

In summary, infoDRILL delivers state-of-the-art rig performance, by making sensor and drilling data visible and clear.

- ▶ Provides all important rig data in one centralized system
- ▶ Seamless integration with drilling optimization systems
- ▶ Fewer sensors required – costs reduced
- ▶ Implemented electronic pipe tally
- ▶ IADC based reporting
- ▶ Customizable and expandable to meet bespoke requirements



20%
INCREASE
IN RIG UPTIME

Real-time data acquisition of drilling processes allows the driller to respond more quickly in critical situations. This improves efficiency and increases rig uptime by up to 20%.

▶ Discover how infoDRILL can give you more control of your rig.
Get in touch with sales@bentec.com



Maximise rig & equipment uptime

Finding ways of reducing NPT is key to saving money, both for contractor and operator. Bentec rigCARE can support this goal by identifying potential delays in production and reducing costs associated with on-site service support.

rigCARE is a secure web application designed to visualize and analyze a wide range of drilling and equipment data. It's accessible through devices such as a PC, smartphone, tablet or smartTV with any web browser, for ultimate convenience.

It ensures real-time drilling and equipment information is available, wherever personnel happen to be and enables the monitoring of single items of equipment or the entire rig fleet from anywhere in the world.

SPEED AND EFFICIENCY

rigCARE can speed up troubleshooting times, ensure repairs are carried out faster and prevent potential large-scale problems before they occur. Access to the historical rigCARE database gives specialists vital background information on known equipment problems and fixes, leading to faster, more effective repairs. And in many cases, rigCARE removes the need for a technician to visit the site at all.

- ▶ Resolves 70% of equipment service issues without a service engineer visiting the rig site
- ▶ Reduces Non-Productive Time
- ▶ Reduces repair and material costs
- ▶ Defines maintenance and inspection tasks
- ▶ 24/7 online/remote support from Bentec experts

See Case Studies 2 and 3 on pages 19 and 20.



70% OF SERVICE ISSUES RESOLVED REMOTELY

Based on 65 top drives running over 30 months, rigCARE remote access has resolved more than 70% of service issues without a service engineer visiting the rig site.

▶ Find out how rigCARE can help you reduce NPT and save money. Get in touch with sales@bentec.com

anticollision

SYSTEM

Up to 20% higher tripping speed and significantly increased safety

The Bentec Anti-Collision System tackles head-on two key objectives in the drilling industry. Namely, the safety of the rig crew, by preventing structure and equipment collisions. And improved performance while tripping, by increasing tripping speeds.

Two redundant PLC systems – independent from each other – monitor the actual hook position, hook load and hook speed, to calculate the distance of the travelling equipment from crown block, drill floor and interlocked rig equipment. This results in an exact prediction of braking trigger points, to stop the movement of travelling equipment automatically, at working points and before it collides with the structure or other rig equipment.

This provides a high degree of protection, preventing personnel injury, rig damage and resulting NPT.

FULL INTEGRATION FOR SMOOTH OPERATIONS

Various Bentec equipment, such as Bentec Top Drive or Bentec Iron Roughneck can be interlocked with the Anti-Collision System. This eliminates collisions between the Link Tilt and racking board or travelling equipment and the Iron Roughneck. The Anti-Collision System is designed to be fully integrated with further equipment, such as complete pipe handling systems etc. via the Bentec Rig Zone Management System.

The Anti-Collision System does the job of continuously managing the travelling equipment position. It automatically brakes and halts hoisting and lowering. This means the driller can focus on actual drilling tasks, instead of being potentially overwhelmed with information and controls.

Exact calculation of automatic braking means manual repositioning to pre-defined working points like fingerboard or tool joints is unnecessary. This promotes repetitive hoisting and lowering of the travelling equipment and leads to significantly higher tripping speeds of up to 20%. All of which results in enhanced rig performance and faster wells.

- ▶ Higher tripping speeds of up to 20%, enabling faster well delivery
- ▶ Repetitive and predictive rig tripping performance
- ▶ Increased levels of safety
- ▶ Collision avoidance reduces NPT



TIME
REDUCED
BY 20%

Higher tripping speeds of up to 20%, enabling faster well delivery.

▶ Keep your personnel safe and increase efficiency with our Anti-Collision System. Get in touch with sales@bentec.com



Increases ROP by up to 30% by mitigating stick-slip

Our 30+ years of knowledge and more than 250 installations of Soft Torque Systems has enabled us to take the next step and launch Bentec optiTORQUE.

This exciting innovation is designed to significantly enhance drilling performance by mitigating torsional oscillation of the drill string and the resulting stick-slip effect. The technology is based on Shell's global standard Z-Torque algorithm, which aims to absorb all torque waves arriving at the surface in a much wider bandwidth than the older soft torque rotary system.

AVAILABLE FOR BOTH NEW AND EXISTING TOP DRIVES

We offer two different options for implementing the optiTORQUE into a top drive system. In new build top drive controls, the algorithm can be embedded into the VFD controller software, as a part of the top drive VFD system. No hardware modifications are required. The system is also available as a retrofit package with a separate controller, enabling you to update earlier models.

- ▶ Earlier well delivery due to improved ROP, extended bit life and fewer bit runs
- ▶ No over-torqued drill string connections due to stabilized drill string
- ▶ Reduced hole cleaning costs due to optimized drilling process in difficult formations
- ▶ Improved well bore quality

See Case Study 1 on page 19.



Early indications from one country and 39 wells drilled, showed that a modern rig equipped with optiTORQUE achieved an ROP improvement of up to 30% versus a rig without.

▶ Let us demonstrate how optiTORQUE can increase your ROP. Get in touch with sales@bentec.com



Delivers an increase of up to 50% in sliding ROP in deviated and lateral well sections

Slide drilling is one of the biggest challenges facing contractors and operators of modern wells. The lateral friction typically reduces the rate of penetration and increases differential sticking.

This problem led our engineers to develop Bentec optiSLIDE. Bentec optiSLIDE reduces lateral friction by oscillating the drill string, increases the ROP and delivers wells faster.

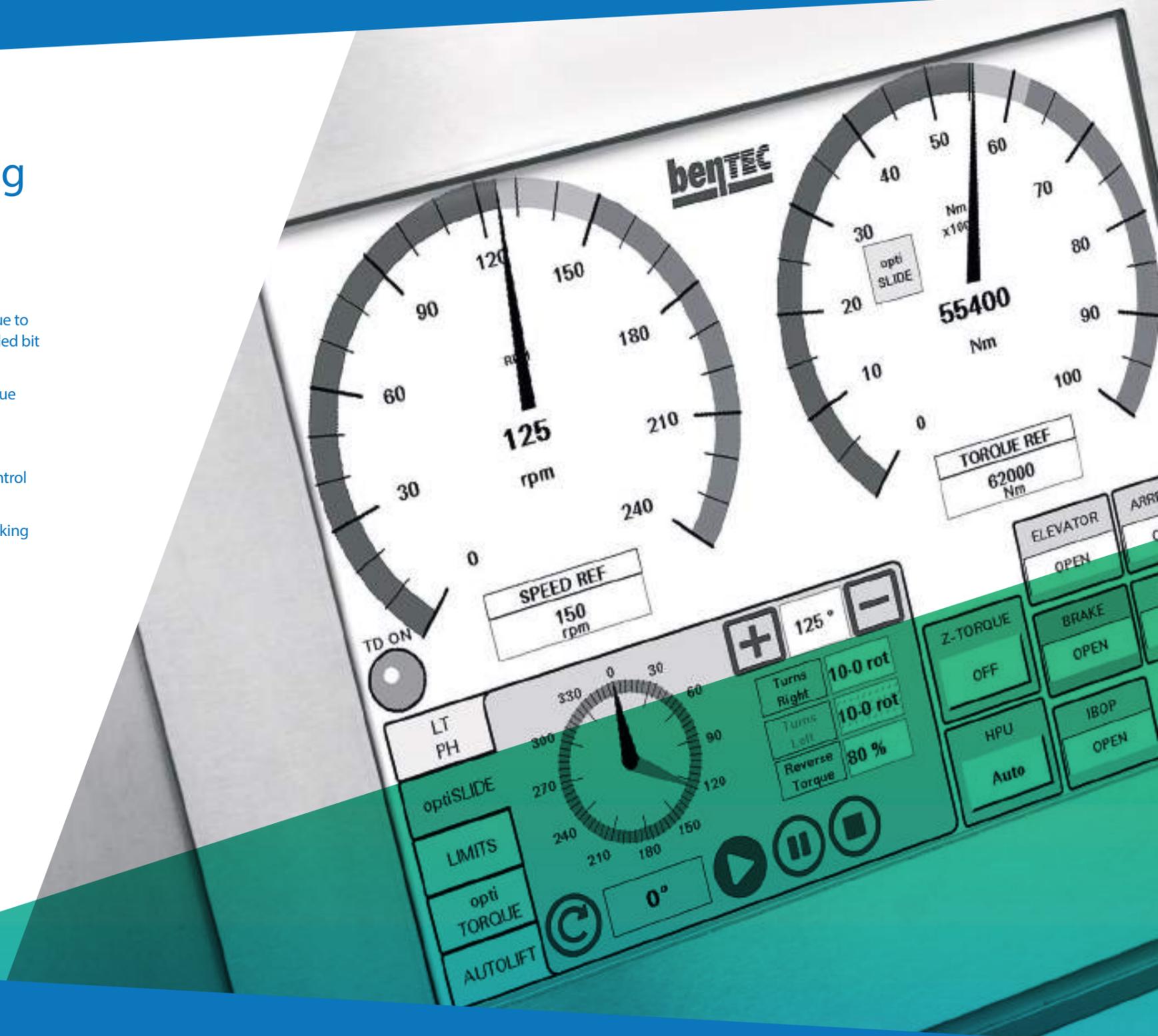
THE TECHNOLOGY TO SUCCEED

The control panel enables the driller to adjust the toolface orientation while slide drilling, without removing the bit from the borehole bottom. This makes steering corrections simple and precise.

This invaluable optiSLIDE software feature is embedded in the top drive controls and available for all AC driven top drives.

- ▶ Earlier well delivery due to improved ROP, extended bit life and fewer bit runs
- ▶ Improved motor life due to less stalling
- ▶ Improved well quality
- ▶ Improved toolface control for directional drillers
- ▶ Avoids differential sticking while sliding

See Case Study 1 on page 19.



Delivers up to 50% increase of ROP in deviated and lateral well sections.

▶ Achieve faster well delivery with optiSLIDE. Get in touch with sales@bentec.com



Faster drilling with our AI-based auto driller

Maintaining high levels of efficiency is a major factor in achieving cost savings. Bentec's optiDRILL, a cutting edge algorithm/AI-based auto driller system is designed to significantly enhance drilling performance, by optimising real-time drilling parameters.

The driller utilizes reference values like rate of penetration, weight on bit, mud pump pressure and TD torque by infoDRILL or HMI and feeds these into the system. The optiDRILL optimizes these parameters while drilling in real-time and reacts immediately to changes in formations, offering the best drilling efficiency.

CHOOSE OPTIONAL EXTRAS

Intelligent cluster drilling –
The optiDRILL uses an intelligent database to record all relevant drilling data, the changes of geological formations and the resulting effects of a cluster well. When drilling further wells in the same cluster, the driller loads the gathered data. optiDRILL's self-learning system enables it to react in advance to changes in the formation and improve the drilling performance from well to well.

Automated drill off tests – A drill off test is simply a step-by-step process of altering drilling parameters to maximise ROP and determine 'Founder Point'. This is defined as the point at which ROP stops responding linearly with increased WOB and RPM. Due to sensitivity of PDC bits to formation changes and the effects of wear, these tests must be performed periodically as the bit's performance dictates. optiDRILL automates these time intensive tests, reducing hold ups and improving productivity.

Our optiDRILL system is available for all kinds of drilling rigs and is easy to retrofit. Its algorithm is implemented in a programmable logic controller, installed in the Power Control Room. The driller controls the system via a separate HMI or Bentec infoDRILL. For add-ons, like intelligent cluster drilling or automated drill off tests, which need access to databases, an additional industrial PC is provided.

- ▶ Drilling with optimised drilling parameters increases ROP by 10% and enables earlier well delivery
- ▶ Intelligent, self-learning auto driller
- ▶ More efficient drilling provides less bit runs, leading to cost savings
- ▶ Improved well bore quality reduces reaming and viper trips
- ▶ 'Learns' through artificial intelligence from previous well data in cluster wells
- ▶ Relieves the driller to focus on crew and rigfloor
- ▶ Easy implementation into new and existing rigs

See Case Study 1 on page 19.



TIME
REDUCED
BY 5%

optiDRILL cuts well delivery time by 5%.

▶ Discover how optiDRILL can enhance your drilling performance. Get in touch with sales@bentec.com



Reduces maintenance costs by eliminating damaging high-pressure pulses

The Bentec optiPUMP is designed to smooth the output pressure of up to four mud pumps. It synchronizes the timing of the piston strokes and eliminates uncoordinated high-pressure peaks.

The resulting, continuous low-peak pressure amplitude extends the lifespan of every part of the mud equipment such as mud pumps, high-pressure piping and pressure pulsation dampeners. This in turn, minimizes maintenance and significantly reduces repair costs.

The continuous mudflow also enables easy analysis of mud pressure pulsation signals from the Measurement While Drilling (MWD) or Logging While Drilling (LWD) tools.

COMPLETE AND PRECISE CONTROL

optiPUMP allows the driller to control all mud pumps by using just one knob, for precise and fast SPM adjustments. In this parallel mode, the slave pumps follow the speed reference of the master pump. The Bentec optiPUMP is either controlled by human machine interface or can be integrated into a Bentec infoDRILL system, to show stroke counters and failure messages. It also allows the driller to set predefined numbers of strokes, to pump precisely calculated mud volumes into the borehole.

The Bentec optiPUMP is available for all electric driven mud pumps and is easy to retrofit in existing systems.

- ▶ Increased lifespan of high pressure piping and equipment
- ▶ Reduced vibrations within the mud pump's mechanical parts
- ▶ Improved MWD/LWD
- ▶ Offers a stable and balanced, high pressurised flow

See Case Study 1 on page 19.



NPT
DOWN
20%

Reduces the NPT time, caused by mud pump and high pressure equipment failure, by up to 20%.

▶ Bring down maintenance costs with optiPUMP.
Get in touch with sales@bentec.com



Saves fuel and reduces maintenance costs

Bentec's optiGEN is smart software that automatically controls the diesel driven generators on drilling rigs. On a standard rig, the operator has to start/stop the diesel generators, on the advice of the driller and according to the generator's utilization. This leads to disproportionately higher usage of generators, resulting in greater fuel consumption, emissions and running hours.

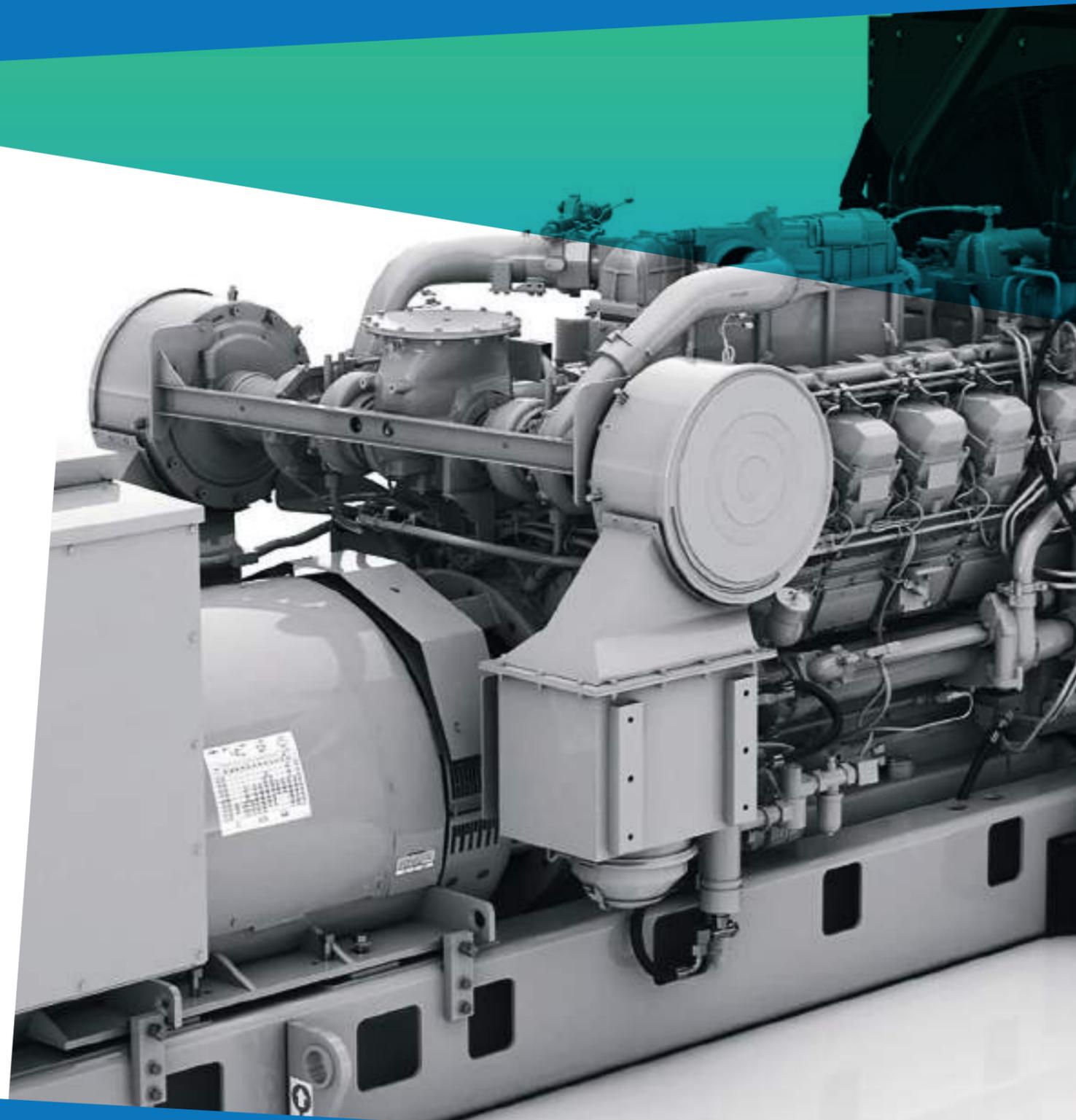
The optiGEN system allows the rig crew to focus on drilling operations without having to continuously monitor generator control. The optiGEN controls the generators automatically, according to the load of the rig consumers.

GENERATING COST SAVINGS

If the load increases under certain various parameters, the optiGEN starts and brings a generator online. If the load decreases, the system works in the opposite way. This means that the generators work very efficiently, not only saving fuel, but protecting diesel generator hardware, to reduce maintenance costs.

In the case of overloaded diesel generators, optiGEN limits the power consumption of the main drives to prevent costly, time intensive blackouts.

- ▶ optiGEN saves up to 30% in generator running hours leading to less diesel consumption and emissions
- ▶ Secures a constant base load, which saves up to 15% in repair costs
- ▶ Enables maintenance of generators within definable schedules
- ▶ Prevents costly, time intensive blackouts
- ▶ Active synchronization enables 80% faster startup of generators



FUEL CONSUMPTION
DOWN 5%

Saves 5% of fuel due to peak shaving and automatic start/stop according to utilization.



EMISSIONS
DOWN 25%

Saves up to 25% of emissions, due to optimal utilization.

▶ Find out how optiGEN can cut your fuel costs and emissions. Get in touch with sales@bentec.com

CASE STUDY 1

BentecIOS

BentecIOS improves well delivery

Evidence of the value delivered by BentecIOS comes from our drilling operations in Oman, where its use is having an impressive impact on well quality and delivery time.

We studied five modern rigs operating over 50 wells in an area notorious for hard rock formation, which presents a challenge for bit wear and well construction.

Our extensive data shows that the rigs with BentecIOS completed 82% of wells ahead of schedule, compared to only 54% of the standard rigs not equipped with BentecIOS.

A closer look at the data from our onshore Middle East and North Africa operations shows that rigs with BentecIOS have up to 8% more bit on bottom time.



- ▶ 82% of wells delivered below AFE
- ▶ Up to 8% more bit on bottom time

CASE STUDY 2

Bentec rigCARE

Reducing the need for support at the rig site with rigCARE

Bentec has more than 65 top drives worldwide connected to rigCARE, most of which are operating in remote locations.

Over a period of 30 months, our multi-disciplinary control centre team of experts have been providing remote troubleshooting and direction on required repairs.

Throughout this time, the team have been able to resolve an impressive 70% of operational issues without a service engineer going to the rig site. This has significantly reduced non-productive time and brought down costs for our clients.

As BentecIOS continues to evolve, rigCARE will play a key part in enabling predictive maintenance by providing us with the data required to evaluate failure trends, equipment parameters and potential maintenance issues.



- ▶ 70% of service issues resolved remotely
- ▶ Reduced NPT
- ▶ Predictive maintenance enabled

CASE STUDY 3

Bentec rigCARE

Remote support means less downtime

One of our customer's high performance land rigs was operating in a remote location with a newly installed top drive and a connection to rigCARE.

From installation and commissioning through to operation, the top drive was monitored from our control centre in Germany.

Two months after the installation of the top drive, the unit unexpectedly stopped working during the 10¾" casing run. An alert prompt appeared on the rig site dashboard at the control centre, notifying the team. Through rigCARE, troubleshooting assistance was immediately employed. Our engineers were able to remotely access the unit's operational history using the data provided by rigCARE and quickly provided a solution.

As a result, the top drive was back in operation 90 minutes after the initial alert prompt.



- ▶ Real time remote troubleshooting
- ▶ Top drive back in operation within 90 minutes
- ▶ Substantial time and cost savings



▶ We'd love to discuss how we can help your business. Get in touch with sales@bentec.com



Let's make it happen

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