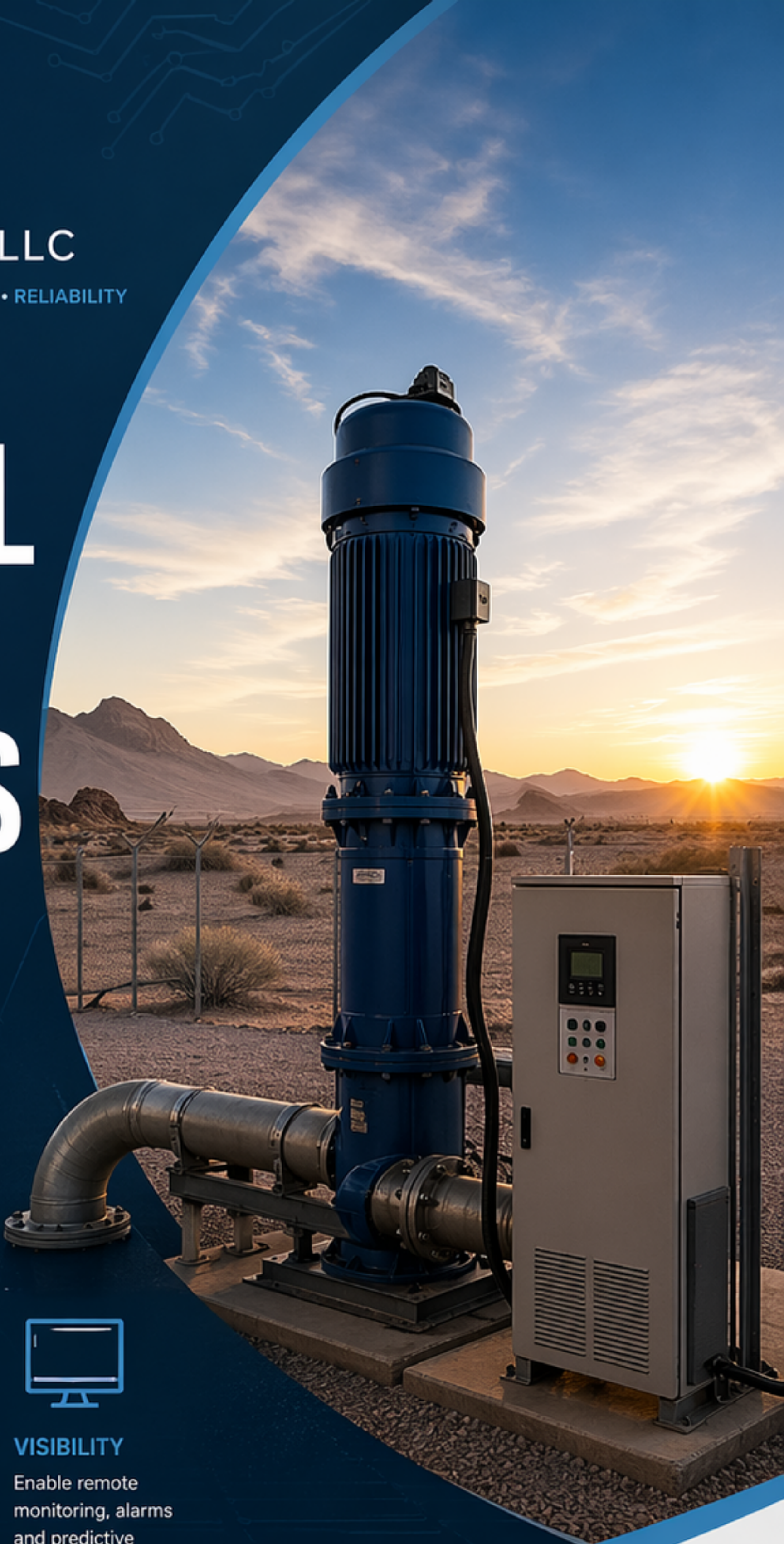
TECHNICAL SOLUTIONS LLC

ENGINEERING • INTEGRATION • RELIABILITY

DEEP-WELL PUMPING SOLUTIONS

ENGINEERED FOR PERFORMANCE

Variable frequency drives eliminate mechanical shock, extend asset life, and optimize operations.



RELIABILITY

Protect equipment and minimize unplanned downtime.

PERFORMANCE

Maintain stable pressure and flow across changing conditions.

EFFICIENCY

Optimize energy use and reduce electrical and mechanical stress.

VISIBILITY

Enable remote monitoring, alarms and predictive maintenance.

BRIDGING THE GAP BETWEEN COMPLEX ELECTRICAL ENGINEERING AND FIELD-READY PUMPING SOLUTIONS FOR WATER INFRASTRUCTURE.

ENGINEERING EXCELLENCE | SYSTEM INTEGRATION | LIFECYCLE SUPPORT

BUILT FOR DEEP WELLS. BUILT FOR THE LONG RUN.

1. EXECUTIVE OVERVIEW

Deep-well pumping systems are not ordinary pump installations placed at greater depth. Depth changes the hydraulic duty, the electrical transmission problem, the thermal operating margin, the maintenance economics, and the practical need for control and diagnostics. For that reason, VFD/VSD selection should be treated as part of the pumping system architecture rather than as an optional accessory added near the end of a project.

In managerial terms, three conditions sharply increase the value of a VFD/VSD: long motor leads, high motor power, and difficult site access. When those conditions are present together, the drive becomes a practical means of reducing current shock at startup, keeping the pump closer to the required operating point, protecting the motor and cable system, and creating operational visibility that can reduce avoidable intervention.

- **The business case is strongest** when reliability, service life, and intervention avoidance are valued together.
- **Energy savings can be significant** in variable-duty systems, but they should not be the only justification.
- **Drive selection must be coordinated** with cable length, filter strategy, protection logic, and control philosophy.
- **For remote harsh-service wells,** the monitoring value of the drive is often as important as the speed-control value.

2. DEEP-WELL PUMPING CONTEXT

2.1 Why deep wells are a distinct engineering problem

A deep utility well typically combines high total dynamic head, long cable runs, difficult retrieval, and high consequences of failure. The system must not only generate head; it must do so repeatedly under changing water levels, uncertain field conditions, and often imperfect supply quality. These realities make a purely fixed-speed operating philosophy increasingly restrictive as depth and power increase.

2.2 Hydraulic challenges

- Total dynamic head is made up of net lift, friction losses, and discharge-side pressure requirement.
- Seasonal or long-term changes in water level move the duty point even when the installed hardware remains unchanged.
- Repeated transients in long risers and discharge lines can create water hammer, check-valve shock, and leakage risk.
- Submersible motors depend on adequate flow past the motor for cooling, so low-flow or unstable operation has real thermal consequences.

2.3 Electrical challenges

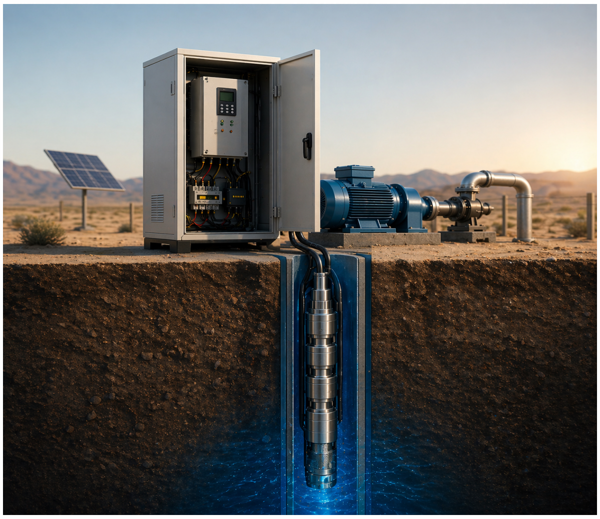
- Long cable lengths increase steady-state voltage drop and can force the motor to draw more current if terminal voltage is depressed.
- PWM drive output on long motor leads can increase insulation stress unless output filtering is engineered correctly.
- High-power direct-on-line starts can create large upstream voltage dips and severe stress on switchgear, transformers, and cables.
- Remote or generator-backed systems are often more sensitive to inrush current, ride-through issues, and nuisance trips.

2.4 Operational and lifecycle implications

The deeper the well and the more difficult the site, the more expensive each intervention becomes. Because the entire assembly may need to be retrieved for significant maintenance, decisions that reduce avoidable electrical, hydraulic, and mechanical shock have a direct lifecycle-cost effect. For management, this reframes the VFD question from "Can the pump run without it?" to "What avoidable cost and risk are accepted if it is omitted?"

Depth amplifies every challenge. The purpose of engineering is to convert that challenge into controlled performance, predictable risk, and lower lifecycle cost.

3. INTRODUCTION TO VFD / VSD SYSTEMS



3.1 WHAT A VFD/VSD DOES

A variable frequency drive takes fixed-frequency AC input, rectifies it to DC, stores the energy in an internal DC link, and then synthesizes a new AC output waveform at controlled voltage and frequency. This allows the motor to be accelerated smoothly, held at a selected speed, and adjusted as process demand changes.

3.2 MAIN FUNCTIONAL BLOCKS

INPUT STAGE → **DC LINK** → **INVERTER SECTION** → **OUTPUT ENGINEERING** → **CONTROL PLATFORM**

INPUT STAGE
Accepts grid or transformer-fed AC power and may include harmonic or EMC mitigation measures.

DC LINK
Acts as the internal energy buffer and stabilizing stage for the drive.

INVERTER SECTION
Synthesizes the motor ontput waveform using power electronic switching.

OUTPUT ENGINEERING
May include output reactors, dv/dt mitigation devices, or sine-wave filters depending on cable length and motor sensitivity.

CONTROL PLATFORM
Implements speed reference, protection logic, feedback handling, alarms, trends, and communication with supervisory systems.

3.3 HOW VFDS IMPROVE PUMPING CONTROL

In pump applications, the practical benefit is that speed becomes adjustable rather than fixed by the electrical supply frequency alone. The drive can hold pressure, flow, or level targets using feedback from pressure transducers, level instruments, or supervisory commands. It also permits deliberate acceleration and deceleration profiles, which are critical in reducing torque shock and water hammer.

> A VFD is more than a speed controller.
> It is a system enabler that improves control, protection, visibility, and overall system performance in deep-well pumping applications.

KEY OUTCOMES

- Smooth acceleration and deceleration
- Reduced water hammer and transients
- Precise pressure / flow / level control
- Improved equipment protection and reliability
- Operational flexibility for changing conditions

3.4 WHY VFDS MATTER IN SUBMERSIBLE PUMP SERVICE

Submersible pumps benefit because they combine difficult access with strong sensitivity to starting shock, cable conditions, and cooling flow. A properly configured drive can enforce minimum safe operating speed, detect abnormal conditions such as low-flow behavior, and log events that would otherwise remain hidden in a fixed-speed arrangement.

- **Soft start** replaces abrupt direct-on-line current surge.
- **Speed can follow real demand** instead of forcing operators to rely on throttling or repeated cycling.
- **Alarm and trend data** create a more actionable operating picture for remote assets.
- **Protection logic** can be coordinated around actual well behavior rather than only motor overload protection.

A properly configured VFD adds control, protection, and visibility where fixed-speed systems cannot.

- Safer operation for the pump, motor, and well
- Fewer unplanned trips and interventions
- Better data for decision making
- Lower total cost of ownership over asset life

4. PROBLEMS AND RISKS WHEN NO VFD IS USED

4.1 DIRECT-ON-LINE STARTING STRESS

Without a VFD, the motor is typically started directly on the supply. In a high-power deep-well installation this means a very large and abrupt current draw, rapid torque application, and a correspondingly abrupt hydraulic and mechanical response. This is especially severe for submersible systems where long cable length and difficult retrieval magnify the consequences of repeated harsh starts.

4.2 VOLTAGE DIP, GRID STRESS, AND CABLE STRAIN

High inrush current can produce upstream voltage dips, particularly on remote feeders and generator-backed sites. The resulting electrical stress can affect not only the motor but also transformers, cables, switchgear, and adjacent loads. On long leads, poor voltage conditions can push the motor toward higher current draw and increased winding heat.

4.3 MECHANICAL SHOCK AND THRUST LOADING

Abrupt startup does not only affect the electrical system. It also generates severe transient mechanical loading in the rotating assembly. For bowl-type submersible pumps, startup-related axial thrust must be absorbed by thrust components and bearings. Repetition of these events accumulates wear that a smoother, controlled acceleration profile could reduce.

4.4 HYDRAULIC TRANSIENTS AND WATER HAMMER

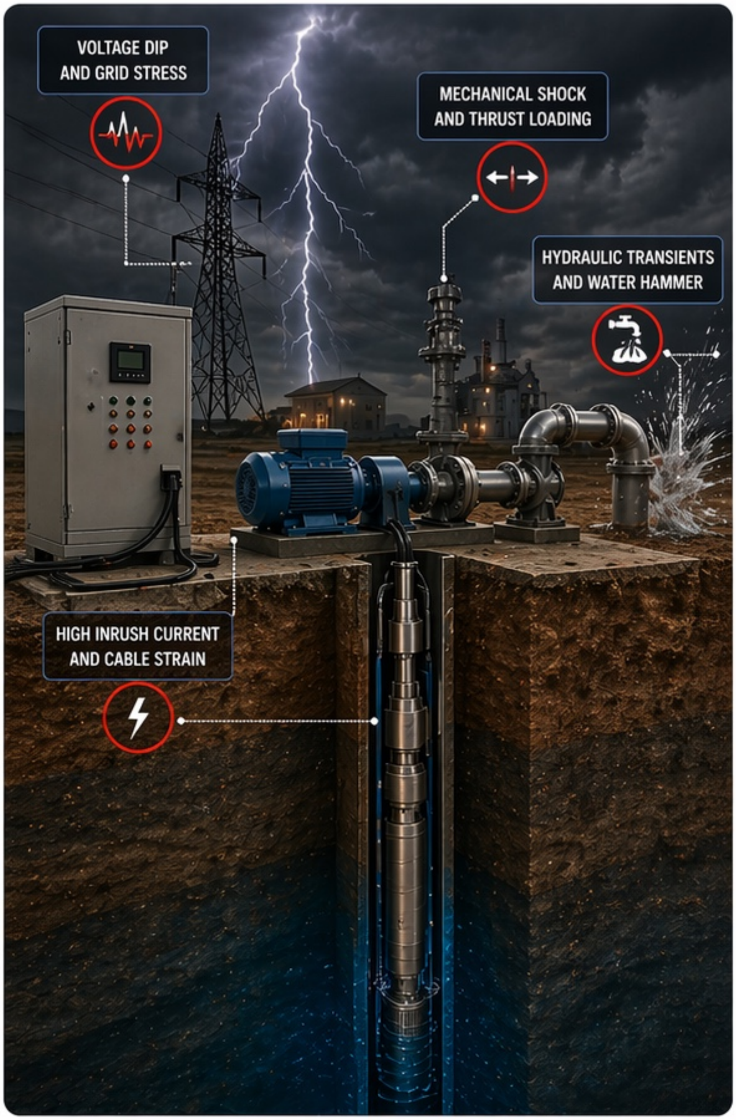
Sudden changes in fluid velocity create pressure transients in risers, manifolds, discharge lines, and check valves. In long systems these transients can loosen supports, shorten the life of piping components, and create intermittent leakage problems that are difficult and expensive to trace.

4.5 LOSS OF ADAPTABILITY

As well conditions shift over time, the fixed-speed pump remains tied to a single electrical speed. Operators often compensate by throttling, cycling, or running outside the most favorable operating region. This is a crude control approach that narrows the useful operating envelope as the field ages.

4.6 LOWER VISIBILITY AND WEAKER FAULT PREVENTION

In a non-drive system, electrical and process data are either absent or must be rebuilt through separate instrumentation. That means less visibility into trends, less structured alarm history, and fewer opportunities to identify abnormal patterns before they become failures.



Risk area	Without VFD	Management consequence
Electrical	High inrush current, voltage dips, cable and winding stress	Higher probability of nuisance trips and accelerated asset fatigue
Mechanical	Abrupt torque and thrust loading at each start	Shorter service life and more frequent maintenance exposure
Hydraulic	Water hammer and uncontrolled transient events	Higher risk of piping, valve, and seal damage
Operational	Little adaptability to changing well conditions	More operator workarounds and less stable system performance
Diagnostic	Limited data and fewer early warnings	Reduced fault prevention capability and weaker service planning

Operating deep-well pumps without a VFD exposes the entire electrical and mechanical chain to stress, reduces reliability, and increases total cost of ownership.

5. GENERAL BENEFITS OF USING VFD / VSD

5.1 SOFT START AND SOFT STOP

A properly configured drive replaces abrupt direct starting with controlled acceleration. It also allows deceleration to be managed deliberately. This reduces current shock, minimizes sudden torque application, and materially lowers hydraulic transients.

5.2 BETTER PROCESS CONTROL

When pressure, flow, or level must be maintained under variable conditions, drive control allows the pump to follow the real requirement rather than forcing the system to dissipate excess energy through throttling. This is operationally cleaner and often more stable.

5.3 ENHANCED PROTECTION

- Minimum-speed enforcement can protect the motor from poorly cooled regions.
- Low-flow or dry-run detection can stop or derate the system before severe damage develops.
- Overcurrent handling can be managed more intelligently than in a simple fixed-speed starter arrangement.
- Ride-through and restart logic can improve uptime during short supply disturbances.

5.4 BETTER VISIBILITY AND REMOTE MANAGEMENT

Modern drives provide current, voltage, power, frequency, alarms, trip history, and trend information. For remote wells, this transforms the drive into a useful telemetry node and supports more deliberate maintenance planning.

5.5 LIFECYCLE AND FINANCIAL VALUE

The value of a drive is often largest when measured in avoided events rather than only in kilowatt-hours. Avoiding repeated shock at startup, avoiding certain nuisance trips, and reducing the frequency of premature intervention can have more financial value than a narrow energy-only comparison.

Placeholder for futurp synefit mto, startup-current comparison, or lifecycle-cost visual.

6. ELECTRICAL AND CONTROL DESIGN CONSIDERATIONS

6.1 CABLE LENGTH AND VOLTAGE DROP

In deep-well systems, cable length is not a secondary detail; it is a design driver. Long runs increase resistance and create voltage drop. If terminal voltage falls too low, the motor can respond by drawing more current, which increases heating and stresses the insulation system.

6.2 OUTPUT FILTERING AND INSULATION STRESS

When PWM output is applied over long motor leads, fast voltage transitions can create damaging terminal stress. For this reason, deep-well applications frequently require more deliberate output engineering, including the use of output reactors or sine-wave filtering. This is particularly relevant where borehole and submersible pump configurations are involved.

6.3 GROUNDING, SHIELDING, AND PACKAGE INTEGRATION

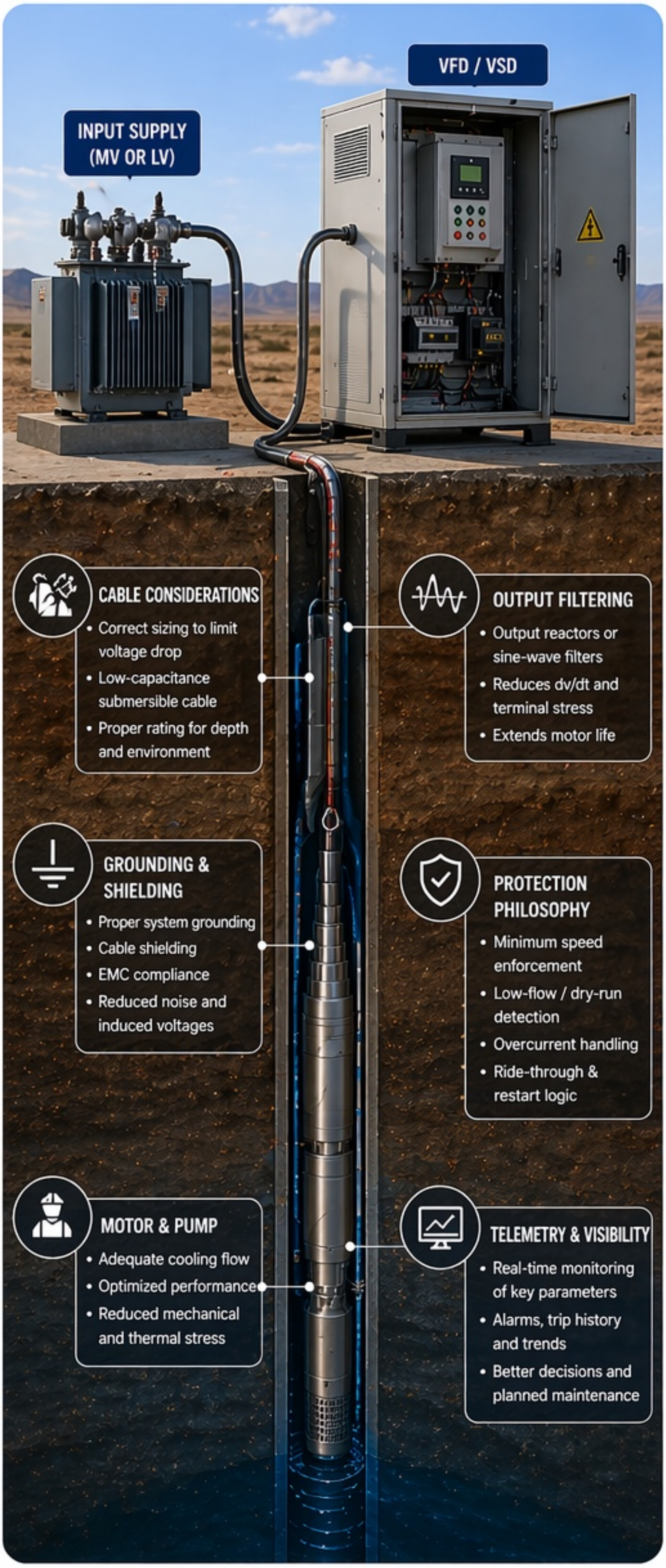
Cable type, grounding, shielding, and EMC measures must be designed as part of one package. A drive cannot be evaluated in isolation from the motor lead, filter choice, and installation practice.

6.4 PROTECTION PHILOSOPHY

- Define allowable start frequency and restart logic.
- Set minimum speed and low-flow protection around real cooling requirements.
- Coordinate trip thresholds with process priorities and maintenance strategy.
- Use alarms and trends as management tools, not only as operator messages.

6.5 LOW-VOLTAGE VERSUS MEDIUM-VOLTAGE CONSIDERATIONS

As power and distance increase, medium-voltage architectures become increasingly attractive because current is lower for the same power. That can reduce conductor burden and feeder losses. However, the optimum architecture must be assessed against the installed motor voltage, existing switchgear, transformer arrangement, and retrofit practicality.



KEY TAKEAWAY

Electrical and control design in deep-well pumping is a system-level exercise. Cable, filtering, protection, control, and monitoring must work together to ensure reliability, efficiency, and long-term asset life.

7. CLIENT PUMP FLEET FOCUS: UBWM 310 x 4 STAGE PUMPS

7.1 PUMP IDENTIFICATION AND BASELINE DATA

The client pump type discussed in the provided data is the Weir Ulectriglide UBWM 310 x 4 stage submersible pump, driven by a U3306J1 submersible motor. The pump is intended for raising well water and was configured around two lifecycle duties. The pump duty remains at 365.7 m³/h in both cases, while total dynamic head changes from 148 m in Duty A to 172 m in Duty B.

Item	Client pump data
Pump model	UBWM 310 x 4 stage Ulectriglide
Motor	U3306J1 submersible motor
Motor rating	251 kW
Supply	380 V, 3-phase, 50 Hz
Full-load current	481 A
Starting method	Direct-on-line
Permissible starting current	600% FLC
Duty A	365.7 m³/h at 148 m TDH, 78.5% efficiency
Duty B	365.7 m³/h at 172 m TDH, 79.5% efficiency
Minimum submergence	2 m
Client duty point from curve extract	75 l/s, 144 m head, 2915 rpm, 73.5% efficiency
Starts per hour	Hot consecutive 2, cold consecutive 3, allowable 4

7.2 WHY THIS PUMP FAMILY IS ESPECIALLY RELEVANT TO THE VFD DISCUSSION

This pump family is a strong candidate for drive-based modernization because the provided data shows several features that materially strengthen the VFD case: high motor power for a low-voltage system, direct-on-line starting, a very large permissible starting current, a clear change in duty over lifecycle, and mechanical elements that explicitly absorb startup-related thrust.

KEY TAKEAWAY

High-power, low-voltage, direct-on-line started submersible pumps that experience changing duty and startup thrust events are prime candidates for VFD-based control and protection.

7.3 MECHANICAL IMPLICATIONS FOR UBWM 310 x 4

The provided description states that the delivery chamber incorporates a thrust washer to absorb axial up-thrust developed on initial startup, with subsequent down-thrust absorbed by the motor thrust bearing. This wording is especially important. It means startup is not a neutral event for the machine; it is explicitly a thrust event. From a managerial perspective, this is exactly the kind of recurring mechanical load that benefits from smoother acceleration. Reducing the harshness of startup helps reduce cumulative wear on thrust-handling elements, bearings, and the rotating assembly.

- **Abrupt direct starting** increases startup shock on shaft, impellers, retaining components, and thrust-handling hardware.
- **Repeated harsh starts add** to cumulative fatigue even if each individual start remains within nominal limits.
- **A controlled speed ramp** is a practical way to reduce avoidable startup severity without redesigning the pump internals.

WHAT THIS MEANS FOR THE CLIENT

- Reduces electrical stress from 600% FLC starting
- Lowers mechanical wear and extends asset life
- Mitigates hydraulic transients and protects piping system
- Improves control, efficiency, and operational stability
- Enhances protection, visibility, and overall system reliability

7. CLIENT PUMP FLEET FOCUS: UBWM 310 x 4 STAGE PUMPS

7.4 ELECTRICAL IMPLICATIONS FOR UBWM 310 x 4

The motor full-load current is 481 A and the provided motor data permits a direct-on-line starting current of 600% FLC. That equates to an approximate inrush near 2,886 A. In practical field terms, this is a major electrical event. Such a startup can impose severe stress on feeders, switchgear, transformers, and motor leads, especially where the site is remote, where the supply is weak, or where multiple large loads coexist.

For this specific pump family, the electrical significance is not abstract. A drive would eliminate the direct step to full-frequency startup and replace it with a controlled current ramp. That change directly reduces voltage dip risk, reduces cable stress, and improves starting repeatability.

7.5 HYDRAULIC AND OPERATIONAL IMPLICATIONS FOR UBWM 310 x 4

The data shows two duty phases across life with the same flow but different head. That indicates the installed system is expected to operate under evolving conditions. Without a drive, adaptation to those evolving conditions is constrained. In practice, this makes the fixed-speed arrangement less flexible over time. A drive cannot eliminate all hydraulic changes, but it can widen the useful operating envelope and reduce the reliance on crude compensating mesaures.

WHY THIS MATTERS FOR UBWM 310 x 4 PUMPS

- Reduces electrical stress and voltage dip risk
- Protects mechanical components from startup shock
- Helps mitigate hydraulic transients and water hammer
- Improves reliability and operational consistency
- Lowers risk and total cost of ownership

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7. 7.6 UBWM 310 x 4 BENEFITS FROM VFD/VSD

1. REMOVES SEVERE DOL STARTING EVENT

Removes the severe direct-on-line starting event and replaces it with controlled acceleration.

2. REDUCES VOLTAGE DIP AND ELECTRICAL STRAIN

Reduces upstream voltage dip and lowers electrical strain on power infrastructure.

3. REDUCES STARTUP-RELATED THRUST SHOCK

Reduces startup-related thrust shock on the pump and motor assembly.

4. IMPROVES COMPATIBILITY WITH CHANGING DUTY CONDITIONS

Improves compatibility with changing duty conditions across the operating life of the wells.

5. ADDS PROTECTION FUNCTIONS

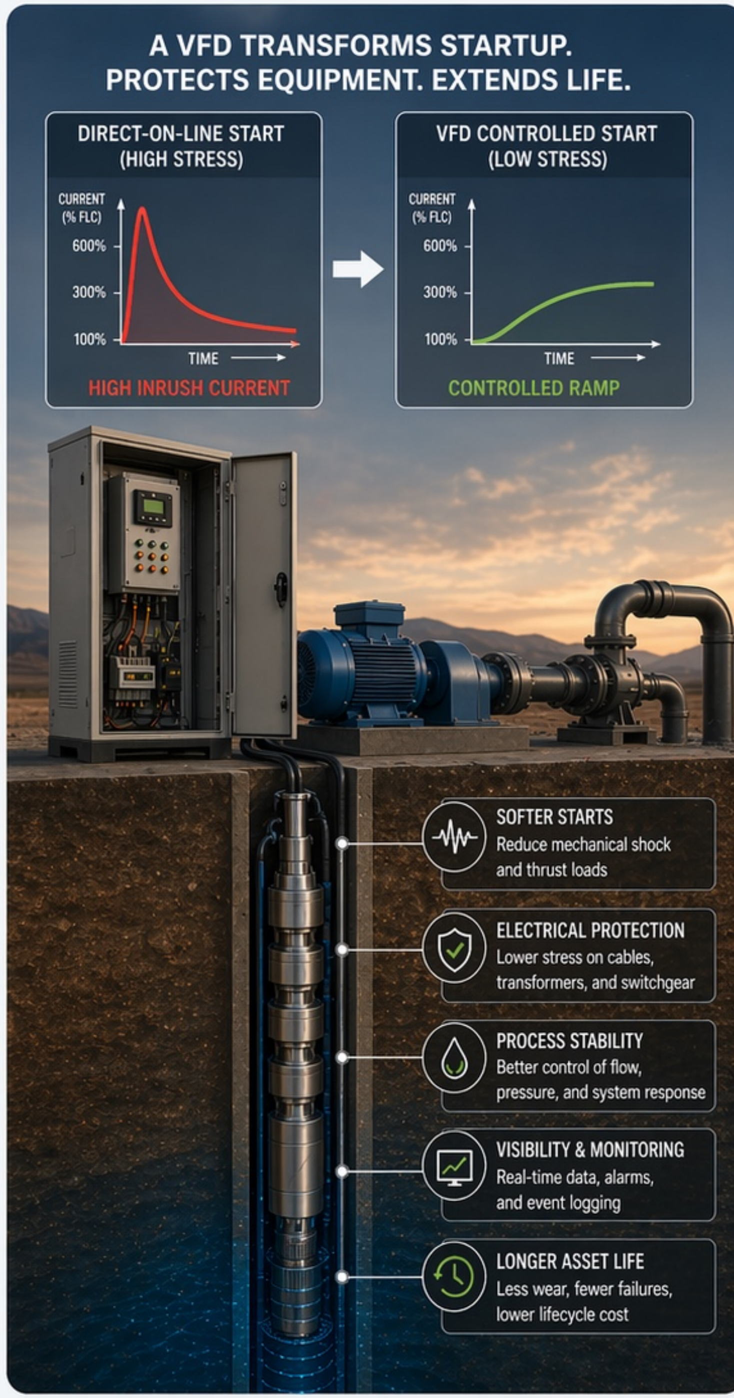
Adds protection functions such as low-flow logic, controlled restart, and event logging.

6. IMPROVES OPERATING VISIBILITY

Improves operating visibility and supports remote monitoring in hard-to-access wells.

7. STRENGTHENS ASSET-LIFE MANAGEMENT

Strengthens asset-life management by reducing cumulative avoidable stress.



RESULT: A VFD/VSD solution for the UBWM 310 x 4 pump delivers safer starts, less stress on equipment, better control, and longer life — maximizing reliability in demanding well conditions.

8. DEEP WATER WELLS IN REMOTE DESERT AND HARSH LOCATIONS

8.1 WHY HARSH LOCATIONS CHANGE THE DECISION LOGIC

In desert and remote locations, the drive case becomes even stronger becaase the cost of every failure is multiplied by heat, dust, travel time, limited service windows, and weaker infrastructure. In such settings, reliability and recoverability are often more important than a narrow first-cost comparison.

8.2 ENVIRONMENTAL AND LOGISTICAL REALITIES

- **High ambient temperature** reduces operating margin for electrical equipment and accelerates stress on components.
- **Dust and contamination** increase enclosure, cooling, and maintenance challenges.
- **Long travel distances** and **restricted access windows** raise response time and outage cost.
- **Remote feeders** and **generator-backed** sites make supply quality more fragile and inrush events more disruptive.

8.3 WHY VFD/VSD IS ESPECIALLY VALUABLE IN THESE WELLS

For remote wells, the drive becomes both a control device and an operating intelligence layer. It helps the system start cleanly, ride through some short disturbances, communicate alarms and trends, and reduce the need for reactive field visits. That combination directly supports more stable production and more predictable maintenance planning.

8.4 MANAGERIAL INTERPRETATION

For management, the correct question is not whether the motor can physically turn without a drive. The correct question is whether the site conditions justify continuing to accept severe startup shock, limited adaptability, and weak visibility when a drive could substantially reduce those exposures.

HARSH CONDITIONS MULTIPLY RISK. A VFD MULTIPLIES RELIABILITY.

HARSH REALITIES IN DESERT AND REMOTE WELLS

EXTREME HEAT — Reduces equipment margin and accelerates aging

DUST & CONTAMINATION — Increase enclosure stress and maintenance challenges

LONG DISTANCE & LIMITED ACCESS — Increase travel time, outage cost, and logistical complexity

WEAK INFRASTRUCTURE & POWER QUALITY — More voltage dips and inrush related disturbances

LIMITED SERVICE WINDOWS — Short windows mean every failure costs more

VFD/VSD DELIVERS MEASURABLE ADVANTAGES

SOFT STARTS — Eliminates severe DOL inrush and reduces stress on electrical system

SYSTEM PROTECTION — Low-flow protection, controlled restart, and ride-through capabilities

VISIBILITY & MONITORING — Real-time alarms, trends, and data for better decisions and planning

ADAPTABILITY — Adjust pump speed to match changing well conditions and demand

LOWER LIFE CYCLE COST — Fewer failures, less downtime, and lower maintenance spend

REDUCED MECHANICAL STRESS — Smoother acceleration reduces thrust shock and wear on pump and motor

REMOTE MANAGEMENT — Supports reliable operation and faster response from anywhere

IMPROVED RELIABILITY — More stable production and longer asset life in harsh environments

BOTTOM LINE:
In remote desert wells, a VFD/VSD is not just an efficiency tool.
It is a reliability, protection, and availability solution.

9. CONCLUSION AND MANAGEMENT VIEW

For deep utility wells, a VFD/VSD should be evaluated as a system-level enabler of reliability, control, and operational visibility. Its importance grows with depth, power, cable length, and remoteness. In those conditions, the drive often moves from being a performance upgrade to being a practical reliability architecture.

The client's UBWM 310 x 4 stage pump data reinforces this conclusion. The combination of **251 kW** motor rating, **380 V** supply, **481 A** full-load current, direct-on-line starting, approximately **600%** starting current, lifecycle duty change, and startup-related thrust loading all point toward a strong modernization case for variable-speed control.

TECHNICAL PERSPECTIVE

A VFD reduces electrical shock, mechanical shock, and hydraulic shock.

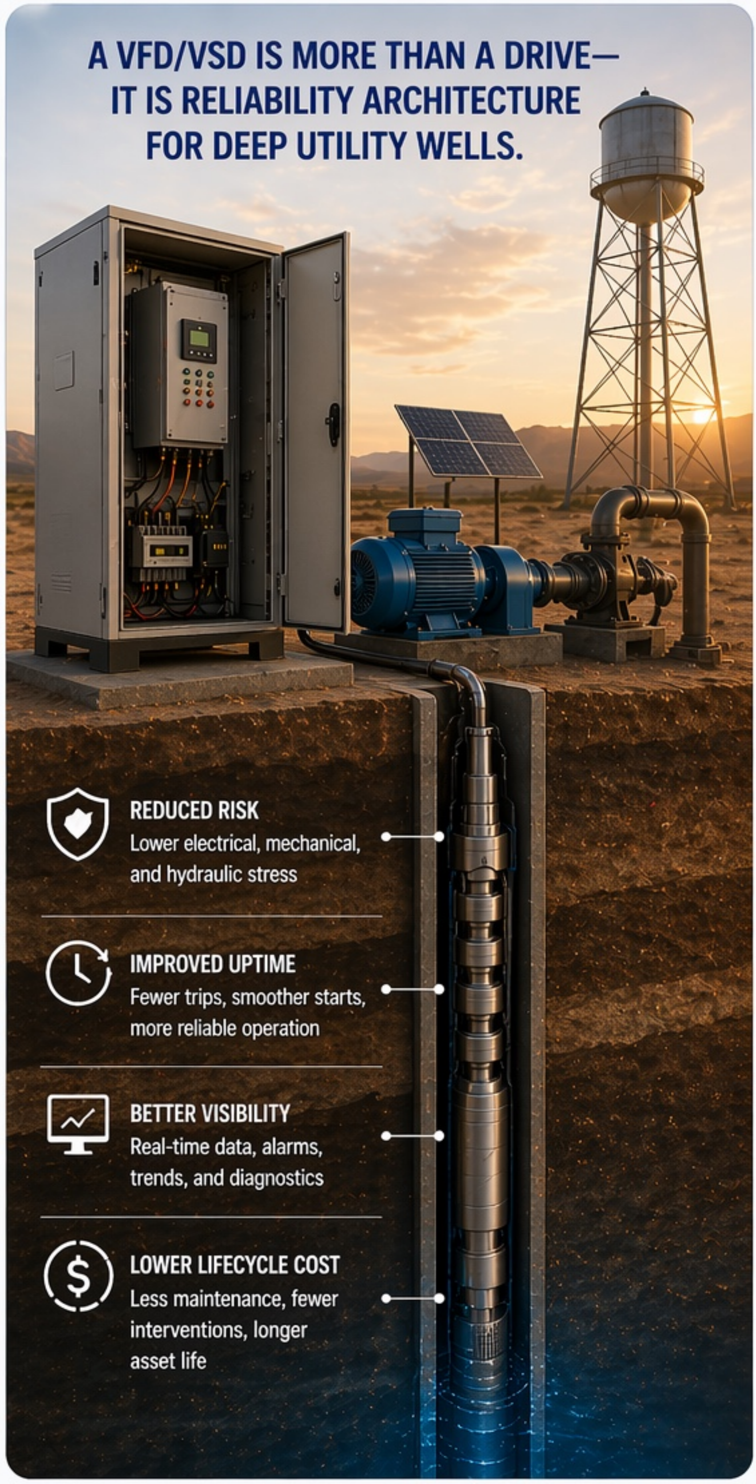
OPERATIONAL PERSPECTIVE

It improves adaptability, protection, and remote visibility.

MANAGERIAL PERSPECTIVE

It can reduce avoidable intervention, improve uptime stability, and support better lifecycle cost control.

This document intentionally leaves several reserved spaces for charts, pump curves, site photographs, and control architecture images so it can later be upgraded into a richer management briefing or external-facing technical flyer without structural rework.



THE MANAGEMENT TAKEAWAY

In remote and harsh locations, a VFD/VSD transforms a high-risk operation into a controlled, visible, and more reliable system — delivering long-term value where it matters most.

CLEAN STARTS
Protect power system and equipment

SMART PROTECTION
Built-in safeguards for pump, motor, and process

REMOTE INTELLIGENCE
Connect, monitor, and act from anywhere

STRONGER PERFORMANCE
Adapt to changing conditions and optimize operations

TECHNICAL SOLUTIONS LLC
INDUSTRIAL TECHNOLOGY

ENGINEERING | INTEGRATION | RELIABILITY

10. TECHNICAL SOLUTIONS – YOUR PARTNER IN VSD EXCELLENCE

Technical Solutions LLC delivers engineered VSD/VFD solutions that enhance the reliability, control, and efficiency of critical pumping systems in the world's most demanding environments.

We combine deep application expertise with proven technology to deliver measurable value across the entire lifecycle.

SMARTER STARTS. STRONGER SYSTEMS. SUSTAINABLE PERFORMANCE.

OUR EXPERTISE

ENGINEERING EXCELLENCE
Deep domain knowledge in drives, motors, pumps, and power systems.

SYSTEM INTEGRATION EXPERTS
End-to-end integration of electrical, control, protection, and communication systems.

RELIABILITY BY DESIGN
Solutions engineered for maximum uptime in harsh and remote operating conditions.

APPLICATION FOCUS
Specialized in deep well, ESP, and high-power variable-speed applications.

LIFECYCLE SUPPORT
From design and commissioning to maintenance and remote support.

PERFORMANCE DRIVEN
Delivering measurable improvements in reliability, efficiency, and total cost of ownership.

OUR VSD / VFD OFFERINGS

ALL-IN-ONE SOLUTIONS
Fully integrated VFD packages with transformer/drive panels, filters, protection, control, and monitoring – ready for installation and operation.

CUSTOM SOLUTIONS
Tailored VSD configurations to meet specific site, process, and infrastructure requirements. Designed for optimal performance and long-term reliability.

FOR LV ESPs
Low Voltage VFD solutions for submersible and vertical turbine pumps. Smooth starts, pump protection, and process control.

FOR MV ESPs
Medium Voltage VSD systems for high-power ESPs with advanced control, power quality, and comprehensive protection.

INDUSTRIES WE SERVE

WATER
Reliable solutions for clean water supply, bosster stations, and distribution networks.

WASTEWATER
Efficient and dependable systems for sewage treatment, lift stations, and reuse applications.

OIL & GAS
Engineered for production water, injection, and enhanced oil recovery applications.

WHY CHOOSE TECHNICAL SOLUTIONS?

Proven Track Record
Successful projects across utilities, industries, and remote operations.

Customer-Centric Approach
We partner with our clients to understand challenges and deliver lasting value.

Quality & Compliance
Solutions built to international standards with rigorous testing and documentation.

On-Time Delivery
Disciplined execution ensures projects are delivered on schedule and within scope.

After-Sales Support
Local and remote support to keep your systems running when it matters most.

Sustainable Impact
Improving efficiency and reliability while reducing energy use and emissions.

OUR COMMITMENT

We are committed to delivering intelligent, reliable, and future-ready VSD solutions that power your operations and protect your investments.

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