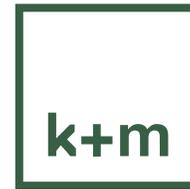


Relief Well Intersection and Ranging Services

Reduce risk, increase safety, and maximize efficiency



k&m
technology
group

Where it is used

Onshore and offshore drilling

How it improves wells

- Reduce risk, increase safety, and maximize efficiency
- Improve ROP and tripping time while minimizing geological risks to construct the well as fast as possible

How it works

K&M Technology Group, a Schlumberger company, is a leading drilling engineering consulting group that uses science-based engineering approaches to plan and execute wells requiring interception and ranging, including relief and plug and abandon operations, to reduce risk, increase safety, and maximize efficiency. Our phased approach includes

Phase 1: Planning

A well is planned to enable completing it in the shortest time practicable with minimal risk of failure, while ensuring the safety of personnel. K&M performs a detailed feasibility study of the relief well construction design and program, including

- offset well analysis and mechanical-earth modeling
- survey management to increase well position accuracy and surface-location validation
- trajectory design for effective and efficient well interception
- optimized BHA operational sequence to safely reduce time in all interception phases, interception-point determination, and dynamic kill-simulation modeling using Drillbench* dynamic drilling simulation software (if required)
- risk assessment and management of operational and geological hazards

Phase 2: Locating and Following Target

This phase locates the relative position of the relief well to the target well using proven,

fit-for-purpose ranging technologies to reduce well construction time and HSE risks. K&M provides recommendations and access to the latest ranging technologies while managing anticollision risks of premature, unplanned interception. Current ranging technologies include

- active magnetic
- active acoustic using Sonic Scanner* acoustic scanning platform
- active resistivity with GeoSphere HD* high-definition reservoir mapping-while-drilling service
- passive magnetic

Phase 3: Approaching Target

Phase 3 is directional drilling to a point that converges near the blowing well's casing, BHA, or any target offset well to intersect, within the detection distance of the ranging technologies. K&M Technology Group's services in this phase deliver optimized drilling operations to ensure faster relief-well execution and the most accurate wellbore trajectory to save on sidetrack runs.

- technical and operational practices support (TOPS)

- real-time operations surveillance services (ROPS)
- survey management through WellDefined* drilling survey services

Phase 4: Intercepting Target

The interception phase starts after installing the last casing to minimize the openhole exposure before intercepting the target well. This is followed by drilling to intercept the blowout well and gain hydraulic communication to perform kill operations. K&M plans and monitors the incidence angle and high side to the target well at the intercept point to recommend the required dogleg severity, anticipates any blowout well-positioning issue, and supervises the directional drilling toward the target well to the intercept point.

Phase 5: Dynamic Well-Killing Operations

The well-killing operation phase establishes communication between the relief well and the target well by hydraulic communication, milling, or perforating. If required, kill mud is pumped into the target well to stop any flow from the reservoir. K&M aids in the dynamic modeling of hydraulics to confirm the dynamic kill parameters.



K&M plans and monitors the drilling angle of a relief well to the target well intercept point. Well-killing operations subsequently begin by penetrating the target well and implementing dynamic kill parameters.