

AMC COREWELL™ delivers improved core sample recovery

CASE STUDY

AMC COREWELL™ along with AMC's experienced technical expertise overcame challenging geological conditions, such as poor core recovery and severe bore-hole instability, facilitating the early completion of a hole in Northern Cape, South Africa.

Background

Earth Resources had two active rigs exploring for manganese on the PMG Mining project in the Northern Cape Iron Fields. From the beginning, the crew experienced multiple problems down-hole including severe core loss. The lease holder, PMG Mining gave its the three drilling contractors on site an incentive; the company that achieved the highest, most consistent core recovery rate and overall performance would be awarded all future drilling at the site.

After losing a barrel and battling to control bore-hole stability, Earth Resources was keen to improve productivity, core sample quality and quantity. AMC was contacted to recommend a superior fluid solution and provide on-site technical support to boost Earth Resource's chances of being awarded the project.

Arriving at site, AMC quickly tested water quality, analysed fluid properties and viewed the core to better understand hole conditions; water quality was a 7.5pH and total hardness of 450mg / L. Coring commenced from surface or diamond tailed from pre-collars. The geology started off in competent quartzite which normally continued down to 5.0m depending and the inclination of the bore. From 5.0m conditions changed rapidly to broken, hard quartzite with interbedded saprolite and laterite clays for approximately 10.0m. Geology then entered into a black mudstone, with multiple sub vertical layers of broken BIF and Quartz, where recovery rates were historically poor.



Results

- Improved core recovery rates averaging 91%
- Improved hole stability
- Improved rate of penetration up to 3.0m per hour
- Improved fluid management and processes
- Maintained consistent low rotational torque.

The mudstone formation continued to a depth of 150.0m before hitting basement BIF. From AMC's observations, the most prevalent problem was exceptionally poor recovery which instigated the recommendation of AMC COREWELL™.

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Enhancing Mud Systems

Initially the client persevered using a PHPA system comprising of AMC CAP 21™ / AMC EZEE MIX™. It was obvious from AMC's interviews and observations the system was unable to provide the necessary fluid properties to support the clay rich environment. In early discussion, Earth Resources wanted to convert to a Bentonite Polymer system however after much debate and reference to previous positive experiences, they were convinced to trial AMC COREWELL™. For the trial AMC was assigned a HQ T3 hole from surface, drilled at an angle of 90 degrees.

AMC's reasoning for not using a Bentonite system included the limited access to surface equipment; no hydration tanks or quality mixing equipment were available. Undulating hilly conditions called for earthen plastic lined sumps, this combined with the lack of shear and hydration would have caused much wastage and negated any advantage of using a Gel system. AMC provided a PVC mixer to promote best mixing conditions. AMC COREWELL™ system was prepared at a rate of 1.5 kg / m³ producing a funnel viscosity of 48 seconds that eventually yielded 52 – 54 seconds as the system was circulated. SODA ASH was used to condition the base water, the PVC mixer proved most effective creating faster yield with zero "fish eyes" or lumps.

Improving Core Recovery Averaging 91%

Drilling companies are contracted to provide the customer uncontaminated quality core at a predetermined rate of recovery (normally 95 – 98% minimum). Looking at previous drilling history, Earth Resources could only achieve a 10 – 50% recovery rate in the clay bearing formation and black mudstone. AMC COREWELL™ provided an immediate improvement maintaining an average recovery rate of 91% over the 40.9m of drilling.

AMC COREWELL™ continued to deliver unforeseen levels of core recovery, even in the washout zones that were notorious for core loss. Driller's confidence and practices improved dramatically which contributed to longer core runs and faster production.



How Does AMC COREWELL™ Work?

AMC COREWELL™ is a sophisticated blend of multifunctional polymers that when used correctly creates a web-like three dimensional structure that encapsulates and layers over clay surfaces to support and shield.

- Superior bonding and stabilisation of the sidewall
- Protects core integrity and maximizes recovery
- Controls dispersion of water sensitive clay and shale
- Produces significant bore lubrication.

In reactive clay rich formations, AMC COREWELL™ will protect and bond exposed formations, impart sample integrity, maximise recovery rates, prevent dispersion and assist in better settlement of solids on surface.



Drilling in unconsolidated and reactive formations can result in poor core recovery.



Reactive clay rich formations are susceptible to washouts, the hole wall can become unstable and collapse.



AMC COREWELL™ encapsulates clay and shale surfaces, preserving the formation matrix and securing the hole wall.



A polymetric network forms a web-like protective barrier, holding the core together as it travels to the surface.

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Before AMC COREWELL™



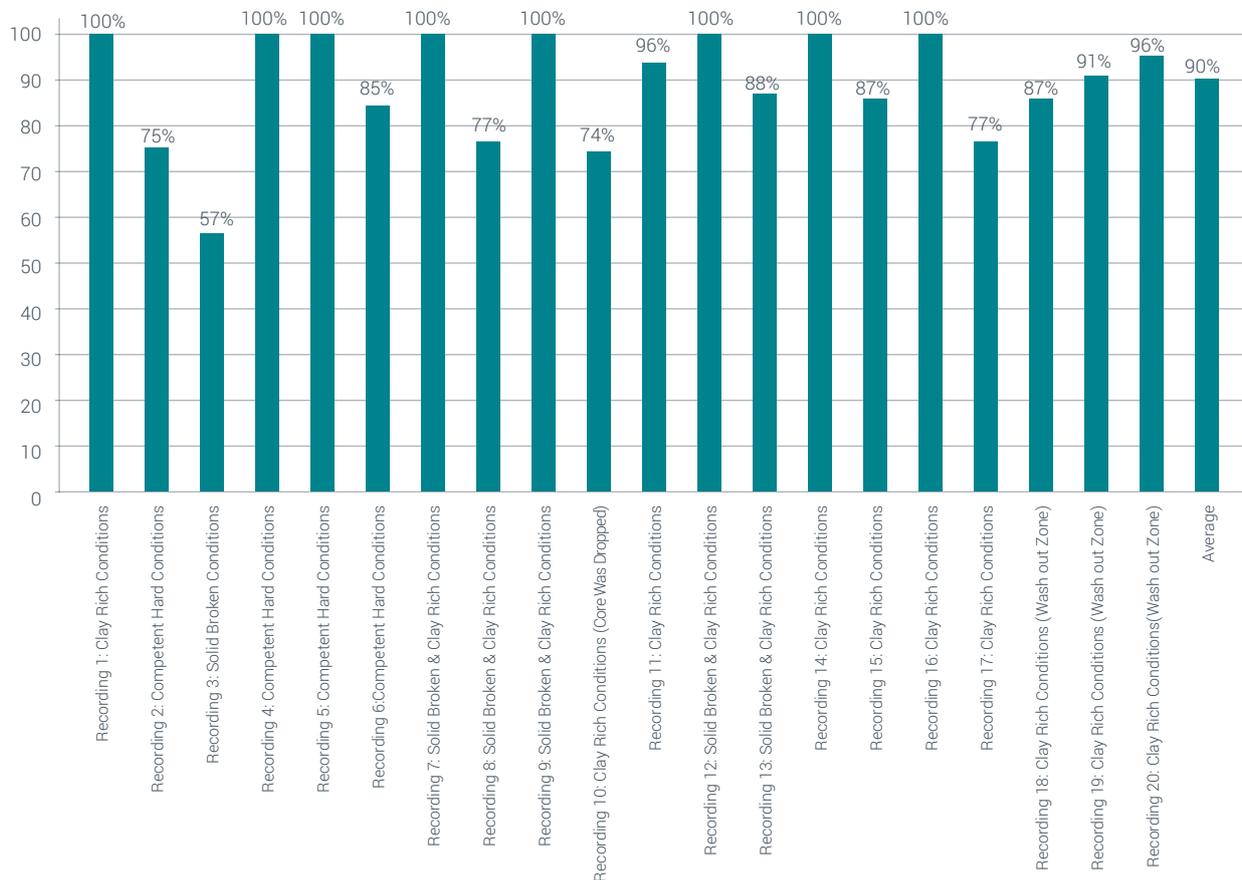
Poor core recovery is visible in the black mudstone.

After AMC COREWELL™



Improved core recovery is visible in the black mudstone after introducing AMC COREWELL™.

Rate of Recovery



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Improved Rate of Penetration

A high Rate of Penetration (ROP) is vital to achieve an efficient operation. Prior to AMC arriving on site, penetration rates were as low as 0.40m per hour using the AMC CAP 21™ / AMC EZEE MIX™ system. After AMC COREWELL™ was circulating through the hole, ROP reached a high of 3.0m per hour. Then improvement in ROP saw the hole being completed ahead of schedule, bolstering Earth Resources chances of being awarded future drilling.

On-site Support Improved Fluid Management Processes

AMC's mud engineers focused on the entire fluid process to ensure the project's success. AMC's on-site support included a full evaluation of the mud program, advice on mixing techniques and training for optimal use of equipment. Poor mixing practices and equipment had previously contributed to a fluid that underperformed and could not complete the job. AMC's engineers introduced the AMC PVC MUD MIXER™, which ensured the fluid system remained in optimal condition. The client was very impressed with the versatility and ease of mixing with the AMC PVC MUD MIXER™. The site supervisor noted that less product was being wasted while producing a better yield, zero "fish eyes" or lumps for the completion of the project.

Crucial Hole Stability Achieved

Earth Resources' drill crew found it difficult to keep the borehole stabilised when encountering the weathered clay rich ground and the mudstone. The fluid properties of AMC COREWELL™ are uniquely formulated to aid hole stability by forming a protective layer to prevent dispersion and collapse. The use of AMC COREWELL™ stabilised the borehole, resulting in gauge holes and reduced breakdown of formation into the system.

Reduced Wear and Tear on Drill Components

Previously, core recovery rates were around 10 – 50% when coring through the clay bearing formations and mudstones, with up to 100% sample loss in the wash-out zones. AMC COREWELL™ provided an immediate improvement, with an overall average of 91% being achieved.

The AMC COREWELL™ system provided:

- Consistent low rotational torque
- Reduced blocking of the waterways in the drill bit
- Reduced core lifter cage from getting stuck
- Eliminated the core from wedging up into the inner tube
- Dramatically reduced clay build up in the annulus and on the outside of the rods
- Prevented down-hole tool loss
- Eliminated core being dropped down-hole
- Clay samples were no longer getting stuck in the splits of the tube
- Dramatically improve drilling conditions
- Dramatically improve core integrity and quantity retrieved
- Due to no overtime, wear to core lifters, lifter cages, reamers and inner tubes was reduced.

Project Outcome

AMC COREWELL™ improved core recovery to an average of 91% compared to previous result of 0 – 50%, proving highly successful in the trial. AMC COREWELL™ delivered high productivity and operational success to the contractor, leading to reduced operational costs and the completion of the project ahead of schedule.

Experienced AMC mud engineers worked with the Earth Resources drill crew, providing fluid management training and recommendations, helping to deliver improved core recovery, Rate of Penetration (ROP), stabilising the borehole and reducing wear and tear on drilling components. The AMC COREWELL™ system enabled the bore-hole to progress quicker and more efficiently than it had previously. A substantial increase in core recovery was critical to the success of the project, core sample recovery reached a peak of 100% and settled to an average of 91% which helped to improve the drill crew's confidence, and deliver comprehensive, complete samples to the client.

Further Information

For more information about this case study, please contact amc@imdexlimited.com or your local AMC representative.

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