

Innovative Products
Environmental Solutions
Global Support



The **imdex** Group



AMC MINERALS LABORATORY CAPABILITIES

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AMC RESEARCH AND PRODUCT DEVELOPMENT LABORATORY CAPABILITIES

AMC’s Research and Product Development Laboratory is a state of the art facility, believed to be the largest of its kind in the southern hemisphere, that provides complete solutions on drilling fluids, completion fluids and production chemicals for both the mineral and oil and gas industry.

AMC’s laboratory is managed and staffed by highly qualified research scientists and industrial chemists with specialist training in drilling fluid development and extensive oilfield and mineral drilling experience.

This facility is unique in that, it performs a large number of roles all under the one roof and includes drilling and completion fluid testing, research and product development, analytical testing, reservoir and core analysis, and biological and environmental testing. The company’s advanced technical capabilities enable it to engineer fit-for-purpose and field-specific solutions in collaboration with its global customers to maximise wellbore value.

The R&D Laboratory utilises a range of standard and state of the art equipment for evaluating drilling, drill-in, and completion fluids and products. This allows AMC to simulate the behaviour of drilling fluids in down hole conditions ensuring products stand up to the most challenging drilling operations.

The laboratory is also responsible for providing technical support to all AMC’s global entities in oil & gas and mineral exploration including manufacturing plants, regional offices and real time rig support to field personnel while also being responsible for analytical services and quality control.

LABORATORIES CAPABILITIES

The chart below shows the testing capabilities of the AMC laboratories based on classification.

CLASSIFICATIONS

| Classification | Classification |
|--------------------------------|------------------------------------|
| Drilling fluids testing | Biological testing |
| Water based mud checks | Biodegradability |
| Synthetic based mud checks | Bacteria toxicity |
| Ofite 900 rheology | Invertebrate toxicity |
| Brookfield rheology | Plant toxicity |
| Particle size distribution | Seed germination |
| Static aged testing | Root elongation |
| Dynamic aged testing | Analytical testing |
| Lubricity | Flash point |
| PHPA analysis | Titrations |
| Garret gas train | Optical microscope |
| Solids analysis | Ion specific electrode testing |
| Cloud point determination | SG testing |
| Water activity | Drill-In fluids testing |
| Corrosion testing | Brix test |
| Clay and shale testing | Thermal Gravimetric Analysis (TGA) |
| Capillary suction timer | Conductivity |
| Methylene blue testing | Density |
| Accretion testing | Quality control testing |
| Moisture content | API 13A spec |
| Linear swell meter | In house QC methods |
| Clay/Shale inhibition | AMC products |
| Clay/Shale encapsulation | Commodity products |



RESEARCH AND DEVELOPMENT

AMC's Perth laboratory and staff contribute to advancements in science and technology not only through its own R&D program but also through joint research projects with the CSIRO (Commonwealth Scientific and Industrial Research Organisation), the petroleum engineering department and mineral research department at Curtin University and DETCRC (Deep Exploration Technology Corporate Research Centre).

DRILLING FLUID SERVICES

The AMC laboratory has the equipment and the staff required to conduct all the standard testing on drilling, drill-in, and completion fluids along with the many high tech pieces of equipment all of which is subject to regular calibration and maintenance in accordance with the ISO 9001, ISO 14001 and OHSAS 18001 certifications the facility maintains.

The high tech equipment utilised by AMC includes:

FANN® IX77 HP/HT VISCOMETER

A viscometer with the latest embedded electronics control module, data acquisition and control software capable of providing standard oilfield rheology data on fluids subjected to 30,000 psig and 600°F (315°C). The FANN® ix77 viscometer can also be used at sub ambient temperatures (to 41°F/ 5°C) to simulate low fluid temperatures like those encountered in deepwater operations. This piece of equipment is used extensively during the planning and drilling of HP/HT wells to measure rheological properties under field conditions and is vital in managing equivalent circulating density (ECD).

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PARTICLE SIZE ANALYZER

The Malvern laser diffraction particle size analyser measures the size distribution of particles in a fluid or powder. The results are presented in a table and graph with particles classified by size in microns. The graph shows the concentration in percent by volume of solids in a particular range. While also displaying D10 (10% by volume less than this size), D50 (median particle size) and D90 (90% of particles smaller than this size) values.

CLAY AND SHALE SWELLING AND INTEGRITY TESTS

A known weight of clay or shale is hot rolled in the test fluid (mud or brine) for 16 hours. The amount of water absorbed and the amount of clay or shale that has eroded away during this time are calculated and used to evaluate the susceptibility of the clay or shale to create wellbore stability issues as well as hole cleaning/cuttings removal issues but also the performance of clay and shale stabilisers to prevent these from occurring.

LINEAR SWELL METER

The linear swell meter measures the degree to which clay or shale pellets exposed to fluids swell. Testing may be conducted at ambient or elevated temperature, in static or dynamic conditions. Results are recorded as plots of swelling % versus time. This test provides a graphical comparison of up to eight inhibitive fluids simultaneously. This means the linear swell meter is ideal for comparing fluids to see which is best suited for a particular clay or shale.

LUBRICITY TESTER

Reduction in metal-to-metal friction is measured using an OFI lubricity tester. A constant force is applied to a contoured metal test block with this force pressing the test block against a rotating metal ring. Both metal components are immersed in the test fluid and the motor torque required maintaining rotation of the test ring is measured. This is used in conjunction with the contact area to calculate a lubricity coefficient.

Lubricity coefficients can be calculated for a fluid before and after the addition of various lubricants and at varying concentrations hence use of the lubricity meter allows identification of the best lubricant for a particular fluid and the optimum concentration.

CAPILLARY SUCTION TIME

Using the capillary suction timer (CST) determines the optimum concentration of inhibitive additives required in the chosen drilling fluid. The principle behind the CST timer is simple; if a fluid does not inhibit and stabilise clay, clay swelling and fine particle migration will occur when the clay is sheared with the fluid. When this mixture is applied to the CST, the solids will gravitate to the bottom and through fines migration form a tightly packed filter cake preventing water migration onto the water conductive paper. Solids in contact

with a stabilising fluid on the other hand, will not form a tightly packed filter cake allowing the water to rapidly pass down the cylinder and readily out onto the paper where two electrodes measure the time for this water migration to occur.

ENVIRONMENTAL STUDIES

AMC has a strong commitment to protect the environment and provide appropriate resources to comply with legislative requirements and provide the means for our customers to do the same. We endeavor to reduce overall emissions and waste generation and make environmental considerations a priority in our planning and development of new products and processes. AMC's environmental studies laboratory performs the following tests:

- ◆ Biodegradability - 28 days Biochemical Oxygen Demand (BOD) testing (OxiTop)
- ◆ Toxicity testing on bacteria - luminescent bacterial survival (MicroTox)
- ◆ Effect on seed germination and root elongation tests (PhytoTox)
- ◆ Toxicity testing on plants
- ◆ Toxicity testing on invertebrates





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