



UMATAC Services

ThyssenKrupp Resource Technologies



ThyssenKrupp

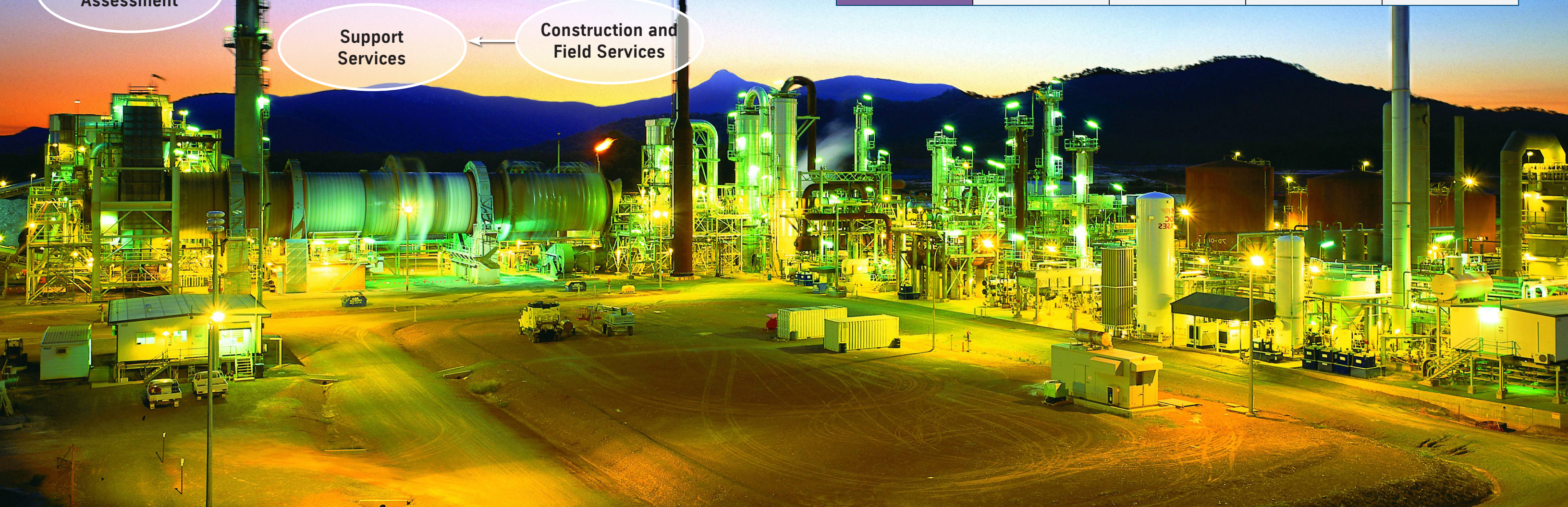
UMATAC | Future Oriented Solutions

UMATAC is the ThyssenKrupp Resource Technologies Group expert in pyro-processing of unconventional hydrocarbon resources worldwide. We provide process plants to the mineable oil industry and custom solutions for soil and waste remediation. At ThyssenKrupp Resource Technologies, we are the oil shale experts. Our Alberta Taciuk Process (ATP) technology is a leading platform for extracting hydrocarbons from solids.

We also offer a range of services and custom solutions to clients at any stage of a project, from small scale initial testing to supplying field services at your industrial facility. Our in-house services and expert engineering staff are available to you.



	Assessment	Project Development	Construction & Field Services	Support Services
Lab Services & MFA Testing	<ul style="list-style-type: none"> Initial Tests 	<ul style="list-style-type: none"> Initial test data provide basis for evaluations 	Support field services as required	Support field services as required
Piloting & Research	<ul style="list-style-type: none"> Batch testing Pilot testing 	<ul style="list-style-type: none"> Product & byproduct testing Develop design basis Coordinate other test work 		Develop test apparatus or R&D program to solve operational problems
Fabrication	Test unit custom fabrication	Test unit custom fabrication		
Engineering Services	Provide input data to FEED engineering	Conceptual designs, feasibility studies, equipment selection	Construction support, QA/QC, operations support, field training	Spare parts design and QA/QC
Troubleshooting			Commissioning services	Technical and process operational support



Laboratory Services & MFA Testing



UMATAC's Research and Development Center includes an industrial laboratory for assessing feed ore quality and measuring the properties of produced oil, water, and gas products. The laboratory is co-located with our pilot plant and research facility, forming an integrated test environment for research and client services.

Our laboratory can handle the difficult analytical challenges typical of oil sands, oil shales, and other unconventional

resources. We have adapted our lab techniques to analyze a wide range of materials: oil shales, oil sands, coals, hydrocarbon contaminated soils, PCB/PAH contaminants, refinery and HPI wastes, waste plastics, and recycled tires.

UMATAC's laboratory is located in Calgary, Alberta, Canada. From this base we support both local and international clients. The laboratory provides data to support the development of hydrocarbon resource projects and related research.

Laboratory Services & MFA Testing

Typical Analytical Services

In-house and external analysis can be performed to determine:

- 1) Ore grade and yield patterns
- 2) Ore properties
- 3) Oil, gas, and water characteristics

Our in house lab capabilities are augmented as needed by the services of third party labs. UMATAC manages all third party engagement.



Feed Sample Preparation

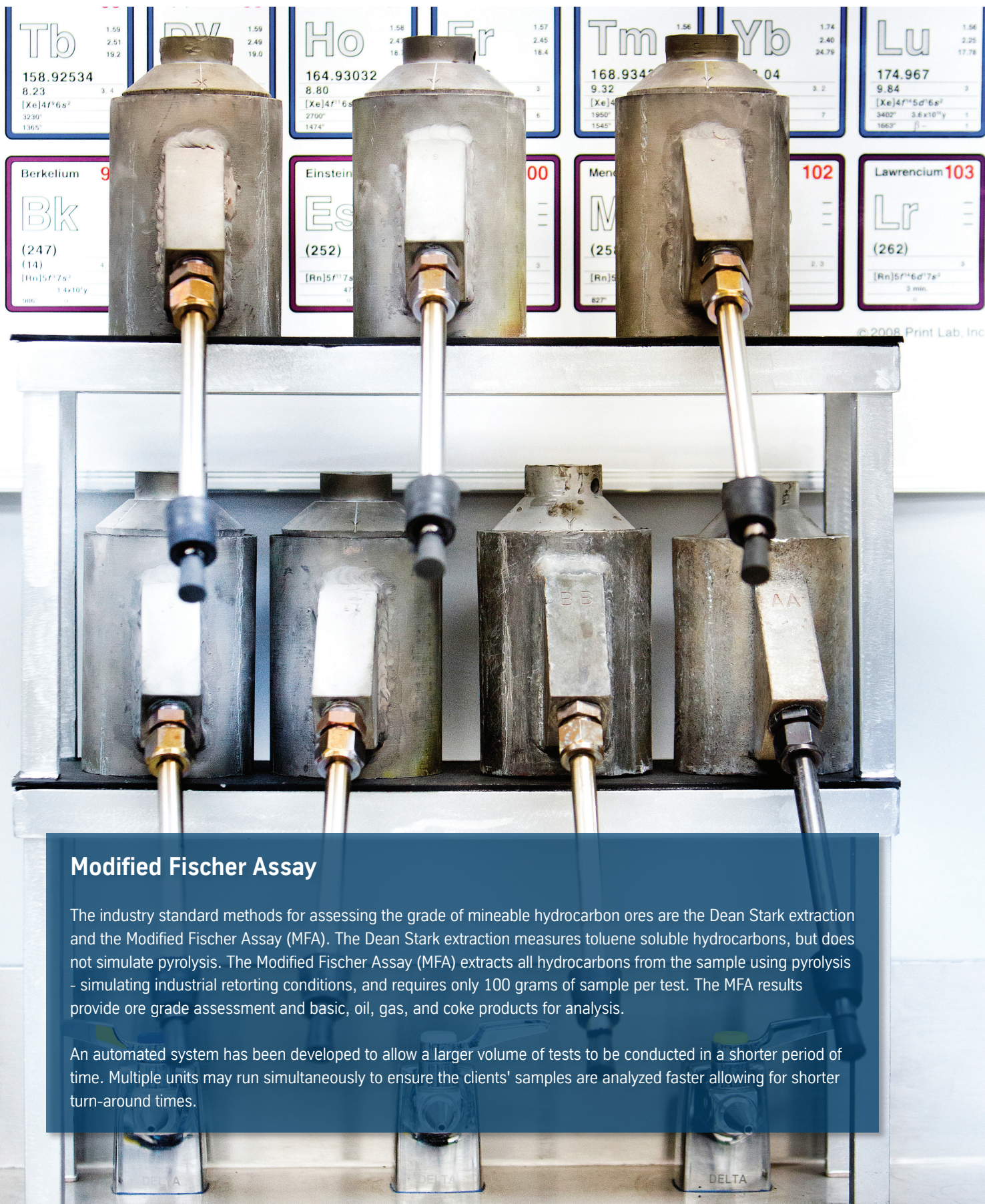
UMATAC Lab Capabilities (Calgary):

- Modified Fischer Assay with Gas Analysis
- Dean Stark Extraction for Oil, Oil Sand, or Hydrocarbon Contaminated Solids
- Moisture Contents of Solids
- Bulk Density of Solids
- Specific Gravity of Solids
- Angle of Repose of Solids
- Ore Strength/Strain Test
- Ramsbottom Carbon Residue
- Loss on Ignition
- Acid Insoluble Solids and Loss on Ignition on AIS
- Particle Size Distribution
- D86 Atmospheric Pressure Distillation of Petroleum Products
- D1160 Vacuum Distillation of Petroleum Products
- Specific Gravity and API on Oil Samples
- Toluene Insoluble Fraction by Filtration and LOI on Insolubles
- Bottoms Solids & Water
- Determination of pH for an Aqueous Solution
- Water Saturation Test
- Determining Water in Oil by Dean Stark
- Gas Chromatography
- GasTech Tube Analysis

ThyssenKrupp Resource Technologies Lab Capabilities (Germany):

- Cement Testing
- Mineralogical Analysis
- Grinding and Crushing Testing
- Atom Absorption Spectrometry
- Sulphur Content
- Scanning Electron Microscopy
- Full R&D Centre with 100 people on staff

Laboratory Services & MFA Testing



Modified Fischer Assay

The industry standard methods for assessing the grade of mineable hydrocarbon ores are the Dean Stark extraction and the Modified Fischer Assay (MFA). The Dean Stark extraction measures toluene soluble hydrocarbons, but does not simulate pyrolysis. The Modified Fischer Assay (MFA) extracts all hydrocarbons from the sample using pyrolysis - simulating industrial retorting conditions, and requires only 100 grams of sample per test. The MFA results provide ore grade assessment and basic, oil, gas, and coke products for analysis.

An automated system has been developed to allow a larger volume of tests to be conducted in a shorter period of time. Multiple units may run simultaneously to ensure the clients' samples are analyzed faster allowing for shorter turn-around times.

Modified Fischer Assay

We have multiple assay units to perform larger test programs and offer shorter turnaround times.

Benefits:

- Industry recognized ore assay method.
- Measures gas and gas condensate products missing from standard Fischer Assay.
- Provides ore grade and pyrolysis yield information.
- Produces small oil, gas, and coke solid samples for analysis.



Modified Fischer Assay Testing

Piloting & Research



Batch Test Unit

The batch unit is normally the second stage of testing. We use this unit to further characterize the ore and identify how it behaves during processing. The unit better represents commercial scale pyrolysis conditions due to larger sample size, rotational mixing, and can be operated at more severe pyrolysis conditions.

The design of the batch unit also makes it an excellent platform for basic process research such as to identify target retort conditions that optimize the recovery of marketable products.

Pilot Plant Trials

UMATAC uses several specialized test units to extract and recover hydrocarbons from ore samples.



Batch Test Unit

The small scale rotating reactor is a flexible test unit for exploring the thermo-chemical behavior of solids and liquids. Normally each test uses 2.5 kg to 5 kg of sample per test.

Benefits:

- Provides larger samples for more accurate and detailed yield data.
- Yields enough oil product for detailed oil, solids, and water characterization.
- Gathers additional information about feed behavior.
- Identifies target retorting conditions for maximum product recovery.
- Capable of many different thermal processing studies such as heavy oil cracking, CO₂ production, bottoms oil recycle, combustion kinetics, and heating value potential of recycled ash and other by-products.

Piloting & Research

ATP60 Mobile Demonstration Plant

The ATP60 is the “Alberta Taciuk Process” plant sized to produce 60 bbl/day of oil when processing 5 t/h of average grade oil sand. The ATP60 platform is very flexible and can process a wide variety of feedstocks. The ATP60 plant is primarily used to demonstrate and prove the technology for a given ore prior to design of a larger facility. However, in some cases such as for remediation of hydrocarbon contaminated soils, the ATP60 is a commercial scale plant.

Benefits:

- Large scale testing of bulk ore samples.
- Demonstrates all major components of the ATP system at a reasonable scale.
- Continuous flow plant closely approximates commercial scale plant operation.
- Produces representative oil, treated solids, water, and off-gas products.
- Collects data specific to each ore that is required for design of larger scale facilities.
- Provides opportunities for operator training and demonstration of the technology to stakeholders.

ATP60 Mobile Demonstration Plant

The ATP60 plant has processed oil shale, oil sand, and hydrocarbon contaminated soils and sludges from around the world. Over 40 varieties of ore have been tested.

Located in Calgary, Alberta, the ATP60 is available to test bulk samples of feed ore. The plant may be transported to a remote location for on-site testing or demonstration, but in most cases bulk samples are shipped to Calgary.

UMATAC is experienced in thermal extraction, recovery, and primary upgrading of hydrocarbons from soils. We are always willing to experiment with new feedstocks and work with our clients who have novel and unusual feedstocks to meet their specialized needs.



Fabrication



Test Unit Fabrication

Over 2,500 square meters of shop floor is available to support R&D activities. Standardized in-house tests can be altered and new equipment built to suit the specific requirements of each industry, each ore, each client.

UMATAC boasts a strong technical team with in-house engineering and trade labour. Our fabrication shop and specialized operations personnel have developed numerous test units to research the properties of feed stocks from all over the world.

A strong focus is placed on research and technology development in the mineable oil industry. Challenging problems exist which require innovative solutions. We have proven experience in developing custom fabricated test equipment capable of providing the analytical and experimental data to confirm the technical validity of conceptual models.

Prototypes of various scales have been developed which simulate the different reactions taking place within the Alberta Taciuk Processor. We push the limits of industry knowledge and are determined to find the right solution for our clients.

Engineering Services

We Offer Complete Solutions

We have the technical knowledge and experience to support projects through each stage of development, whether the resource is oil shale, oil sand, and any other hydrocarbon-bearing feedstock.

We can evaluate your feedstock in a screening study, provide a conceptual study/project definition where we assist you in determining what your needs are, and come up with fully engineered solutions and plant equipment.



Our team has the experience to provide comprehensive feasibility studies including: cost estimates, preliminary engineering designs, mass and energy balances, process flow diagrams, and process instrumentation diagrams. We also supply detailed engineering field technical services such as construction, commissioning and start-up technical assistance to the owners.



Hydrotreated Product Oils

Troubleshooting

Troubleshooting

UMATAC's engineering team has years of operations experience and design/technical knowledge in the mineral processing and non-conventional oil industry.

Our team of highly skilled professionals will come to your plant site, evaluate the problems and help with developing and implementing solutions.



UMATAC Industrial Processes

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