

## Revamped UMATAC Batch Test Apparatus

UMATAC is continuously developing and improving in-house technologies that support the unconventional oil industry. The Modified Fischer Assay is a first stage ore assessment, while the batch unit is the second stage of testing used to further characterize the ore. The batch unit tests larger ore samples over a broad range of operating conditions. This aids in characterizing important feedstock properties and establishes target process variables required for further ATP pilot processing and preliminary design studies

The first prototype was constructed in 1984 and over the last 30 years, more than 3000 batch runs have been completed. As part of the 2012 redevelopment plan, the UMATAC batch unit was rebuilt into a modular/portable testing apparatus tailored to our new Research and Development Centre. The test unit was re-built from the inside out, with all new electrical / mechanical controls, interlocking to ensure operator safety, and a ventilated housing. The revamped design focused on robustness, greater flexibility in operational control, and online safety.

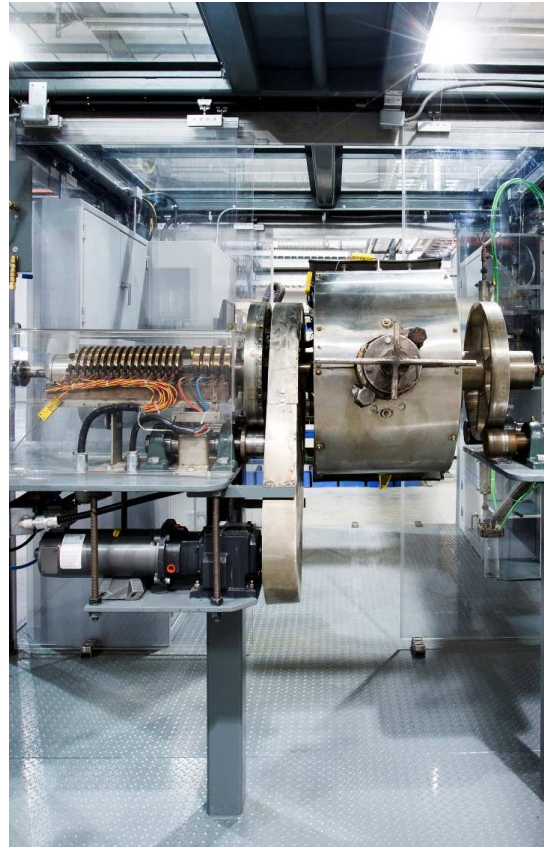


Figure 1: Batch Unit Core Assembly

The UMATAC batch unit consists of an electrically heated rotary retort which thermally desorbs and decomposes an organic mineral resource through pyrolysis in an anaerobic environment. Retorting experiments exploring the thermal chemistry of solids and liquids are conducted in this unit and closely replicate the behavior of a rotating pyro-processing vessel, typical of the ATP technology.

### Two standardized in-house experiments are routinely performed:



Figure 2: Preparing for Hot Injection

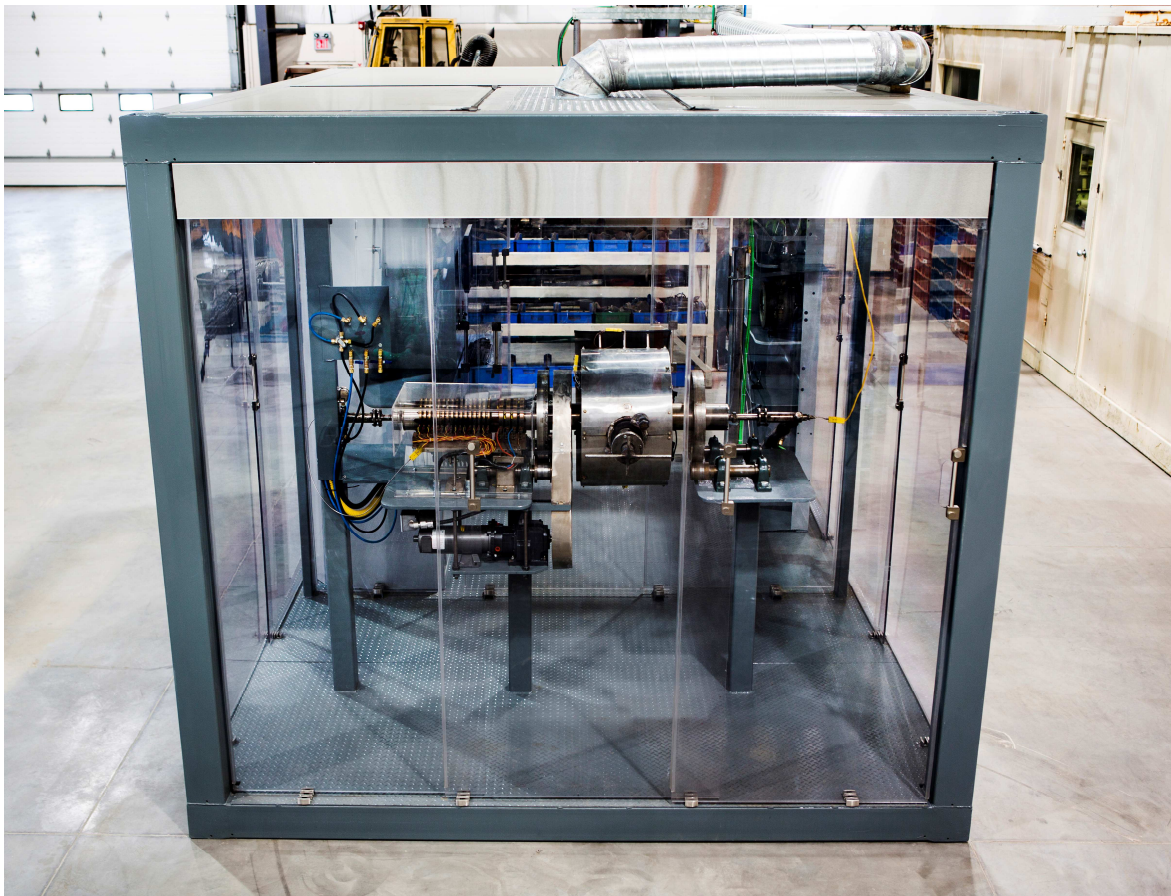
- 1. Ramp Run.** Sample placed into retort and temperature ramped from ambient to target over 60 minutes, resulting in gentle pyrolysis similar to Fischer Assay/Rock-Eval.
- 2. Hot Injection.** Retort is preheated to target temperature prior to multiple feed injections, resulting in severe pyrolysis conditions replicating the ATP Processor.

The dynamic nature of this machine allows us to identify target retorting conditions, enhancing process recovery of marketable products at the piloting scale. Additionally, many non-standard tests are routinely executed, with operational conditions, and run objectives established on project dependant basis.

Key advantages of the technology include:

- Provides more accurate/detailed yield data compared to MFA or Rock-Eval Testing.
- Yields larger volumes of products (water, oil, non-condensable gas) allowing for more in depth analysis.
- Gathers additional information about feed behavior (abrasion, friability).
- Allows us to identify target retorting conditions for maximum product recovery.
- Helps determine pyrolysis yield sensitivity and allows us to study combustion and drying behaviour of the ore.

The batch unit is an important tool in supporting research and development within the unconventional oil industry.



**Figure 3: Complete Enclosed, Modular Batch Unit Skid Package**