Ablation

Breakthrough Technology to Reduce Uranium Mining Costs and Increase Resources

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A JOINT VENTURE BETWEEN

ABLATION TECHNOLOGIES, LLC
AND BLACK RANGE MINERALS LIMITED

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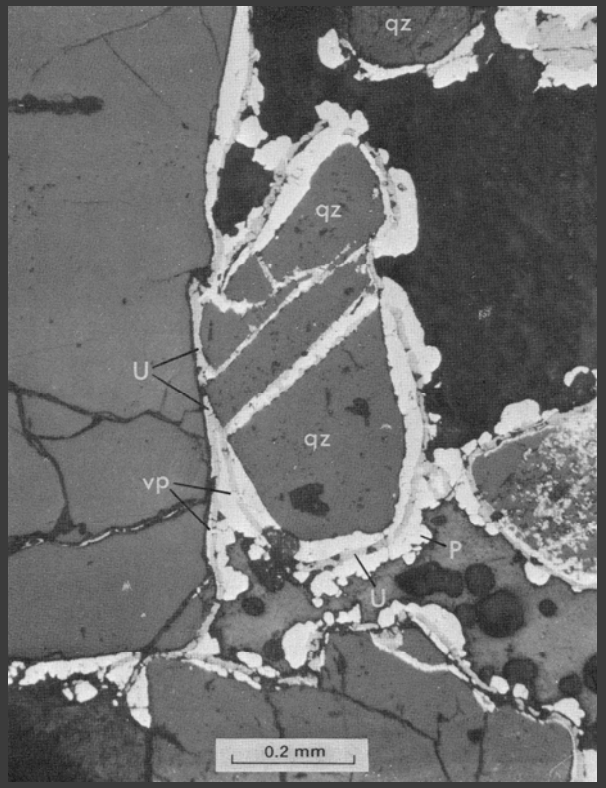
Ablation Technologies, LLC

BLACK RANGE MINERALS

WHAT IS ABLATION?

- Ablation is a mechanical process for separating a rock into its individual components.
- Demonstrated to be highly applicable to sandstone-hosted uranium deposits.
- In sandstone-hosted uranium deposits the uranium minerals form a patina (outer coating) around individual grains that make up the mineralized host rock and fills the interstitial spaces between the sand grains.
- Ablation uses kinetic energy and water to force grains against each other, removing the patina from the barren sandstone grains.
- In many cases, virtually all of the uranium mineralization reports to the fine fractions.
- The fine material can be physically separated by screening to collect a high-grade, high-value, low volume ore product.

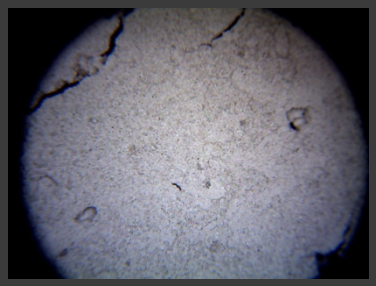
Photomicrograph of Uranium in Sandstone Formation



Ident	Mineral
qz	quartz
U	Uranium

Harshman, E. N. *Geology and Uranium Deposits, Shirley Basin Area, Wyoming*

Pre-Ablated sandstone-hosted uranium ore

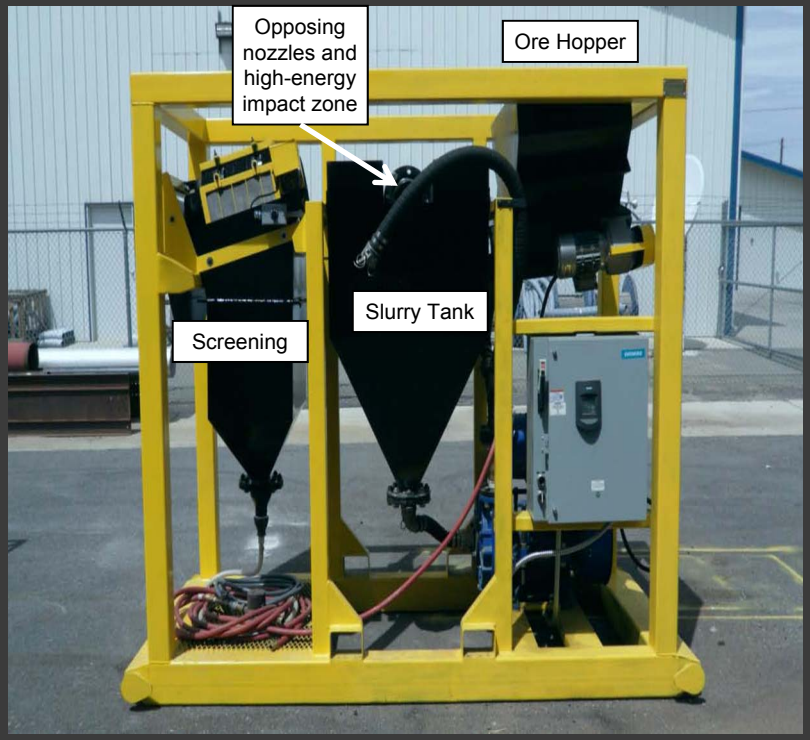


Post-Ablated Fine-grained High-Grade Ore

Post-Ablated barren material

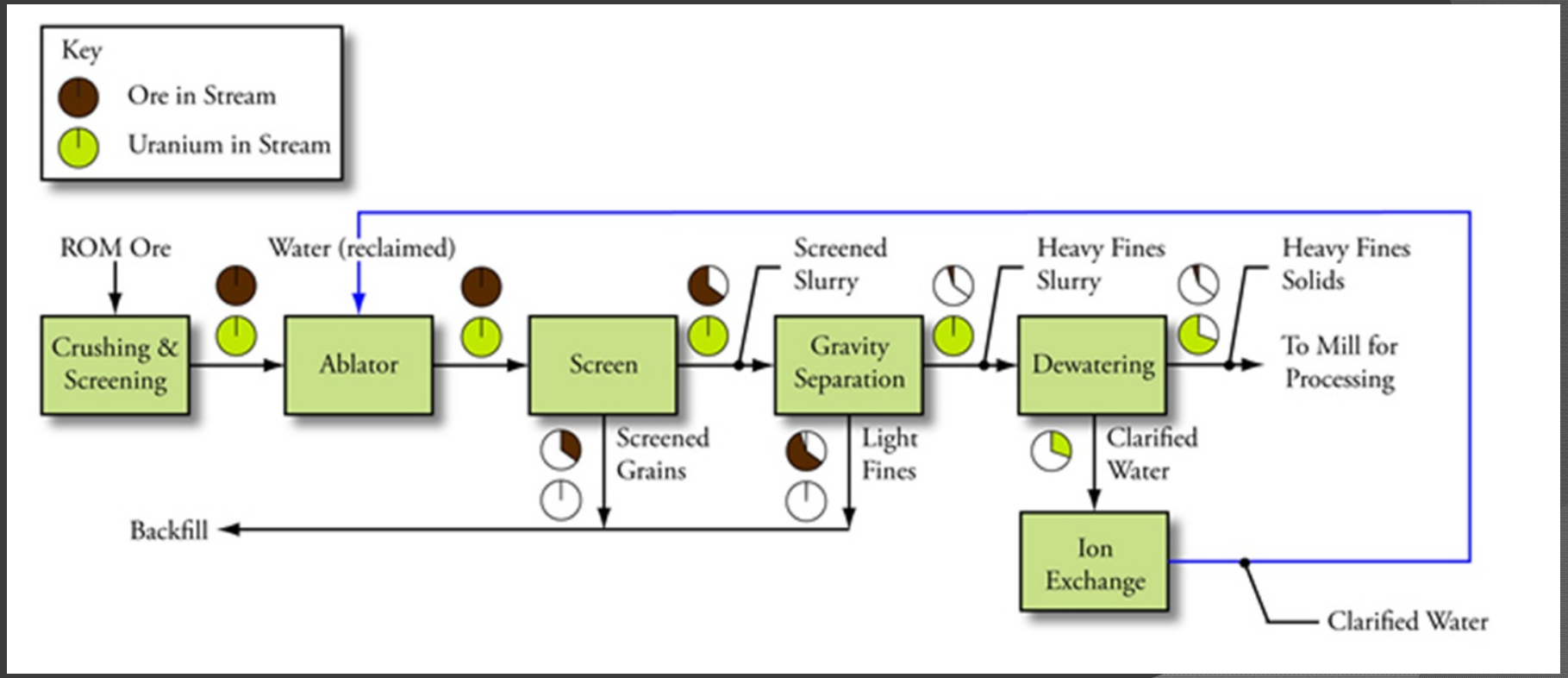
THE DEVELOPMENT OF ABLATION

- A pilot-scale plant, with nominal capacity of 0.5 ton/hour, has been operational since 2011.
- It has been utilized to undertake considerable testwork during the past three years.
- An ore-water slurry is split into two streams and ejected through two opposing nozzles.
- The slurry collides in a “high energy impact zone”, where Ablation occurs.
- Testwork on multiple sandstone-type deposits consistently produces an ore containing 90-95% of the uranium in ~10% of the mass.
- Recently recoveries of 95-99% have been consistently returned when incorporating a secondary upgrade circuit.
- The low volume fine-ore product can then be economically transported off-site to produce yellowcake at a conventional processing facility.



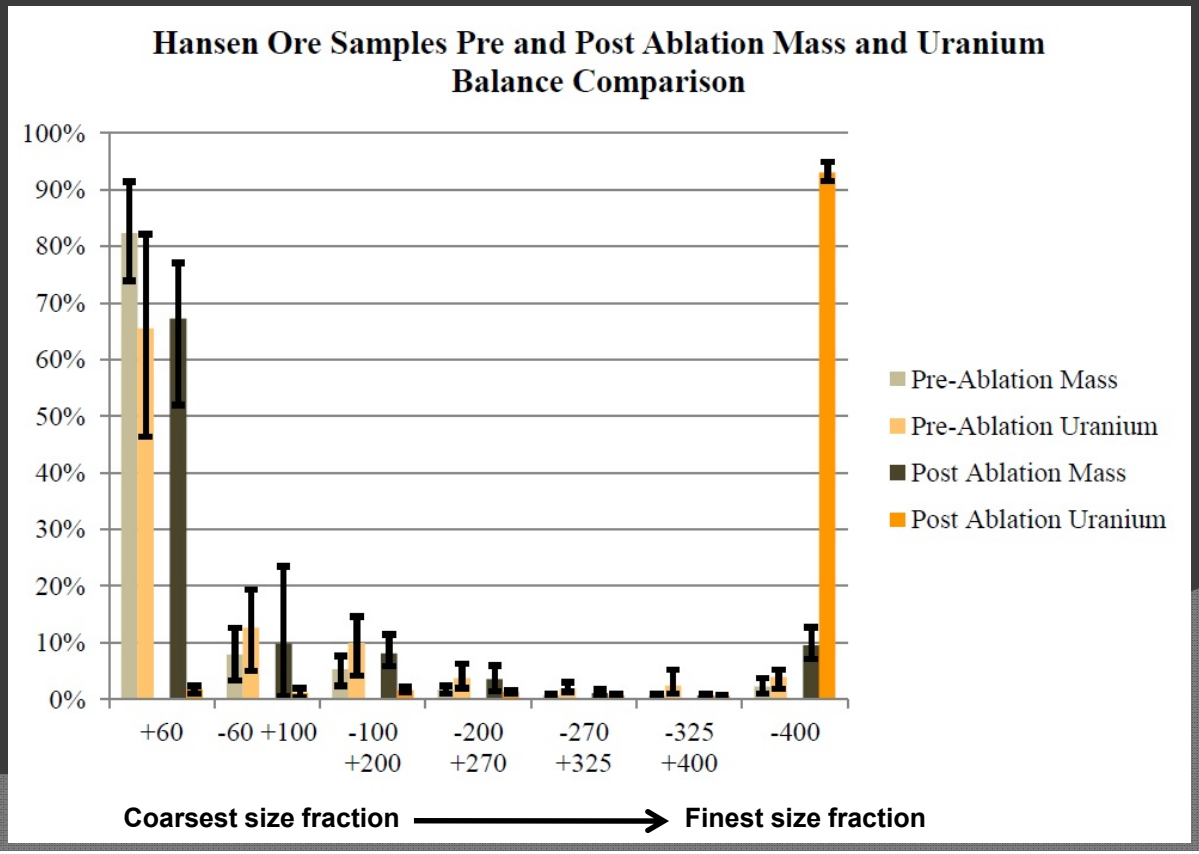
Pilot-scale Ablation unit that treats ~0.5 tonnes/hour. This technology is being scaled up to units that can treat ~5 tonnes/hour.

THE ABLATION FLOWSHEET



ABLATION RESULTS

- Testwork on multiple samples from several ore deposits showed the majority of uranium in un-Ablated ore is contained in the coarse fraction.
- Post Ablation (with no secondary upgrade) >>90% of uranium can be recovered from the -400 mesh (finest) fraction.



THE BENEFITS OF ABLATION

At the Mine

- Entirely a physical process (no chemicals) – hence streamlines mine permitting.
- >90% of mineralization separated into <10% of the mass.
- Clean, coarse-grained material can be used for back-fill – enabling higher ore body recoveries.

Mine To Mill

- ~90% reduction in transport costs.
- May mean an on-site mill is not required at many currently ‘stranded’ deposits – further streamlining the mine permitting process and reducing capital costs.

At The Mill

- ~90% less material to process, hence:
  - Smaller tanks and equipment for comparable output, hence lower capital requirements.
  - No grinding, hence lower power consumption.
  - Lower materials handling costs.
  - Fewer reagents required.
  - Shorter processing times anticipated, hence design mill output capacity increased.
  - Higher-grade input, hence design mill output capacity increased, therefore lower unit operating costs.
  - ~90% less tailings to dispose, hence lower capital and reclamation expenses.

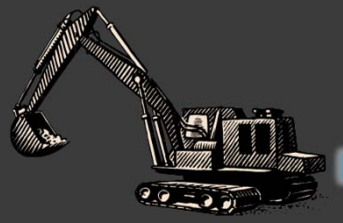
Overall

- Economically recoverable resources are increased, as lower cut-off grades can be applied.
- Utilize ablation to clean-up environmentally unsustainable sites such as historic uranium mining operations

ABLATION MINIMIZES THE SURFACE IMPACT OF OPERATIONS

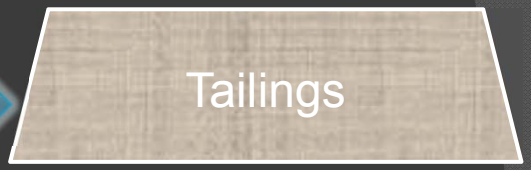
WITHOUT ABLATION

Run of Mine Haul
- Nearby Mill
- Large Volume



Large Mill and Many Mills (one per deposit)

Large Impoundment



Mining:
- Open Pit
- Underground
- UBHM

Same Amount of Product Production

WITH ABLATION

Ablation with Waste Rock Returned to Mine

Ore Transported Offsite Long Distances Possible

Small Mill and Probably Less Mills Through Mill Sharing

Small Impoundment

COMMERCIALISATION OF ABLATION

- During 2013 a semi-commercial scale 5tph processing unit was constructed in Casper, Wyoming
- The 5tph Unit comprises six modules:
  - 1 feed bin/slurry mix tank;
  - 3 interconnected Ablation units;
  - 1 ore classification (screening unit); and
  - 1 dewatering module.
- Modules have been deliberately sized to be readily transportable by road, and to enable deployment to underground mines.

The 5tph Unit during tests in Casper, Wyoming, USA. The slurry mix tank, being fed by a conveyor, is in the foreground. Three interconnected ablation modules are positioned immediately behind the mix tank. Three water storage tanks are evident in the background.

COMMERCIALISATION OF ABLATION

- The nozzle system from the pilot plant has simply been replicated/duplicated for the 5tph Unit.
- Slurry in the 5tph Unit passes once through multiple nozzles that are arranged in series, rather than being re-circulated to pass multiple times through the single set of nozzles available in the pilot plant.
- **Almost 10 times more energy is available in the impact zone in the 5tph Unit than in the initial pilot plant – resulting in dramatically improved performance.**

Nozzle array within the 5tph Unit (the front set of nozzles is deliberately uncovered and slightly offset for illustrative purposes).

INITIAL TEST RESULTS

- Trials of “October” ore in the 5tph Unit commenced in late 2013
  - **Up to 94.5% recoveries of uranium into finest size fractions**
  - Potential to improve to 97-98% recoveries with secondary upgrade
- **Initial results have exceeded expectations:**
  - Process times considerably faster than anticipated; and
  - Only one of the three available Ablation modules has been required to achieve target recoveries of >90% into the finest size fractions
- Probable that throughputs in excess of the nominal target of 5tph can be achieved with the “5tph Unit”
- **Further confirmation that it should be possible to commercialise Ablation in the near-term**

Photomicrograph of “October” ore prior to Ablation

Photomicrograph of “October” ore post- Ablation

“October” uranium ore stockpile in western Colorado

THIRD PARTY'S PLANS TO UTILIZE ABLATION

- Goviex Uranium Inc. has stated publicly that following extensive testwork its preferred development plan for its Madaouela Project in Niger includes utilization of Ablation
- Resources at that project comprise 39.7 Mt at 0.14% eU_3O_8, for a total of 122.3 million lbs of U_3O_8
- The development plan envisages average annual production of 2.53Mlb of U_3O_8 per annum over 18 years, with life of mine production of 45.6Mlb of U_3O_8
- The Ablation JV continues to advance this opportunity with Goviex

CONCLUSIONS

- Ablation is a physical way to isolate mineralization from host rock in sandstone hosted formations.
- Ablation is an environmentally beneficial approach to uranium mining.
- Ablation is a best practices approach to uranium mining.
  - Higher recoveries than conventional uranium mining.
  - Lower cost.
  - Environmentally friendly.