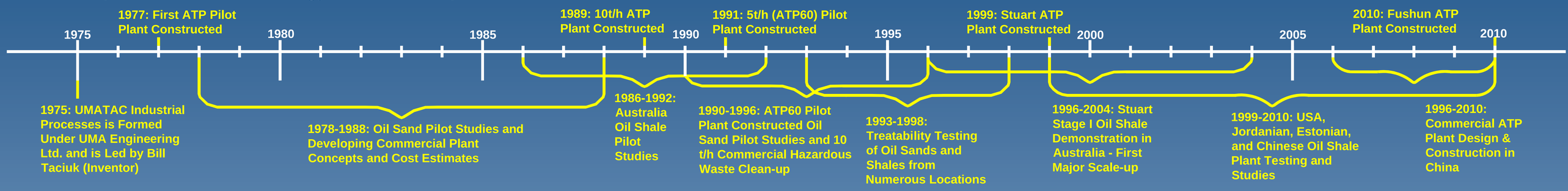
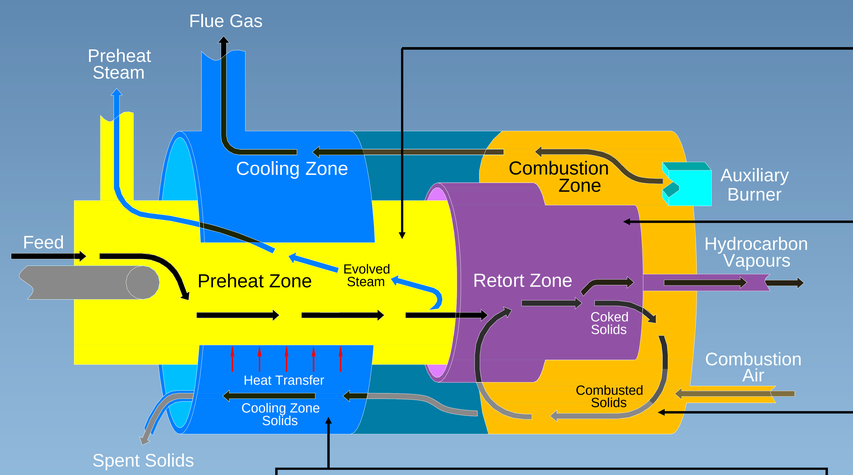
The Alberta Taciuk Process (ATP) Technology
- Projects and Performance -
UMATAC Industrial Processes

AECOM

Development of the ATP Technology – 34 Years of Experience



ATP Processor Schematic



Preheat Zone:
- Feed enters ATP unit
- Indirect heat transfer from the cooling zone
- Feed heated to ~250°C to 300°C
- Feed is dried, generating steam
- Steam-rich vapors are removed
- Preheated and dried kerogen-bearing solids moved to the retort zone through a solids transport seal

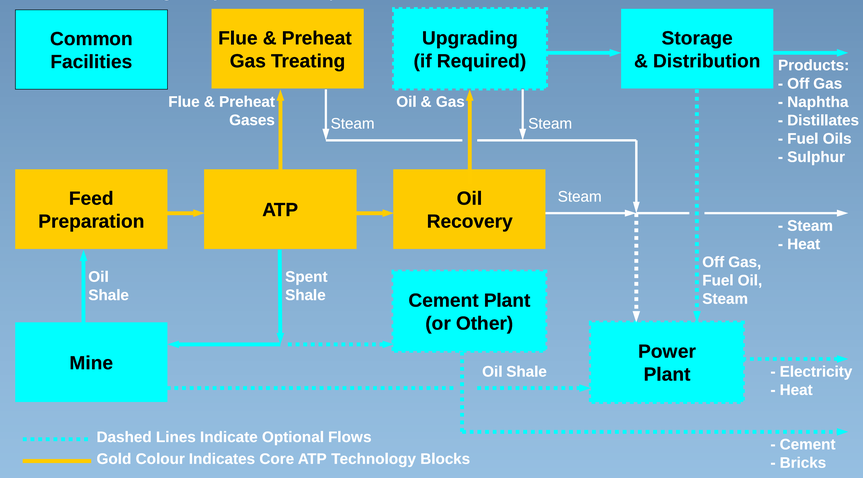
Retort Zone:
- Direct heat transfer from hot spent solids recycled from the combustion zone
- Material heated to ~480 to 550°C in the absence of oxygen
- Pyrolysis occurs yielding hydrocarbon gas, hydrocarbon vapours, and coked-coated solids. Hydrocarbon vapours sent to hydrocarbon recovery system for recovery as liquid and gaseous products.
- Coked solids move to the combustion zone through solid transport seal

Combustion Zone:
- Addition of air to burn portion of coke byproduct from pyrolysis
- Coke combustion usually sufficient to supply all process heat
- Solids heated to ~700°C to 750°C
- A portion of the solids are recycled to the retort zone through a solids transport seal
- Combusted solids and combustion flue gases flow into the cooling zone

Cooling Zone:
- Heat recovery: hot solids and gases indirectly supply heat to the preheat zone
- Solids and flue gases are cooled to ~350°C to 425°C
- Solids and gases leave the ATP Processor

ATP System Block Flow Diagram

The block flow diagram shown below illustrates a typical plant scheme. The ATP produces a full range of boiling point fractions. The system can be configured to recover these products to suit specific project requirements (eg: fuel gas, LPG, naphtha, diesel, gas oil, etc). Spent shale may have use as cement feedstock. The ATP plant may also be combined with a power plant to utilize excess off gas, hydrocarbon liquids, and waste heat.



Demonstrated Performance Advantages

1. Designed to Process Entire Oil Shale Ore (Crushed to -10mm)
   - Complete utilization of ore resource, high oil yield
2. Recovers Heat from Combusted Solids and Gases
   - High thermal efficiency
3. Produces Concentrated Hydrocarbon Vapour Stream
   - Minimum hydrocarbon recovery system size
   - Straightforward hydrocarbon separation and high recovery efficiency
4. Produces High Heating Value Off Gas
   - High heating value off gas is available for use as fuel internal to the process plant facility, for steam production, or electrical generation
5. High Oil Yield
   - High liquid product oil yields; butane and heavier (C4&+) yields are >90% of Modified Fischer Assay (MFA)
6. Clean Oil Product
   - Hydrocarbon vapour scrubber provides a means of removing residual shale fines from product oil stream
7. Uses Residual Coke as Process Fuel
   - Effective utilization of kerogen by products
8. Accommodates Shale Variability
   - Relatively insensitive technology to various oil shale deposits
   - Capable of handling feed materials ranging in grade and moisture content
9. Horizontal Rotary Process Unit
   - Prevents ash slagging at localized hot spots
   - Encourages bed movement and mixing action
   - Allows gas flow through solids
   - Ensures all particles heated to retort temperatures
10. Large Unit Capacity
    - ATP Processor may be designed to process up to ~750 t/h of oil shale
11. Environmentally Responsible
    - ATP produces a dry, hydrocarbon free spent ash
    - ATP systems are equipped with flue gas scrubbing and emissions control systems engineered for the service to meet regulatory requirements

Energy and Resource Utilization

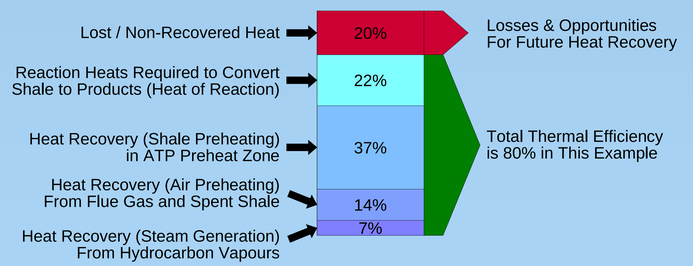
Heat Utilization

The ATP Technology employs heat recovery internal to the Processor to preheat and dry the incoming feed ore. Heat recovery in the hydrocarbon recovery, spent solids cooling, and flue gas handling systems provides additional steam generation and air preheating capacity.

Efficient Use of Resource

The ATP Technology uses low-value coke as the primary process heat source, maximizing net production of valuable products such as off-gas and heavy fuel oil.

Process Heat Distribution for ATP System
Total Heat Input to ATP Processor = 100%



Distribution of Calorific Value of Feed Oil Shale into Products
Gross Calorific Value of Feed Shale = 100%