CHATTANOOGA PROCESS™

synthetic crude oil

changing the technology

The Chattanooga Process: Description

- Patented technology
- Uses heated hydrogen in fluid bed reactor to convert unconventional oil resources to high-grade, low-sulfur synthetic crude oil
- Uses proven sub-processes of existing commercial & industrial operations
- New technology to revolutionize economics of obtaining synthetic crude oil from unconventional sources

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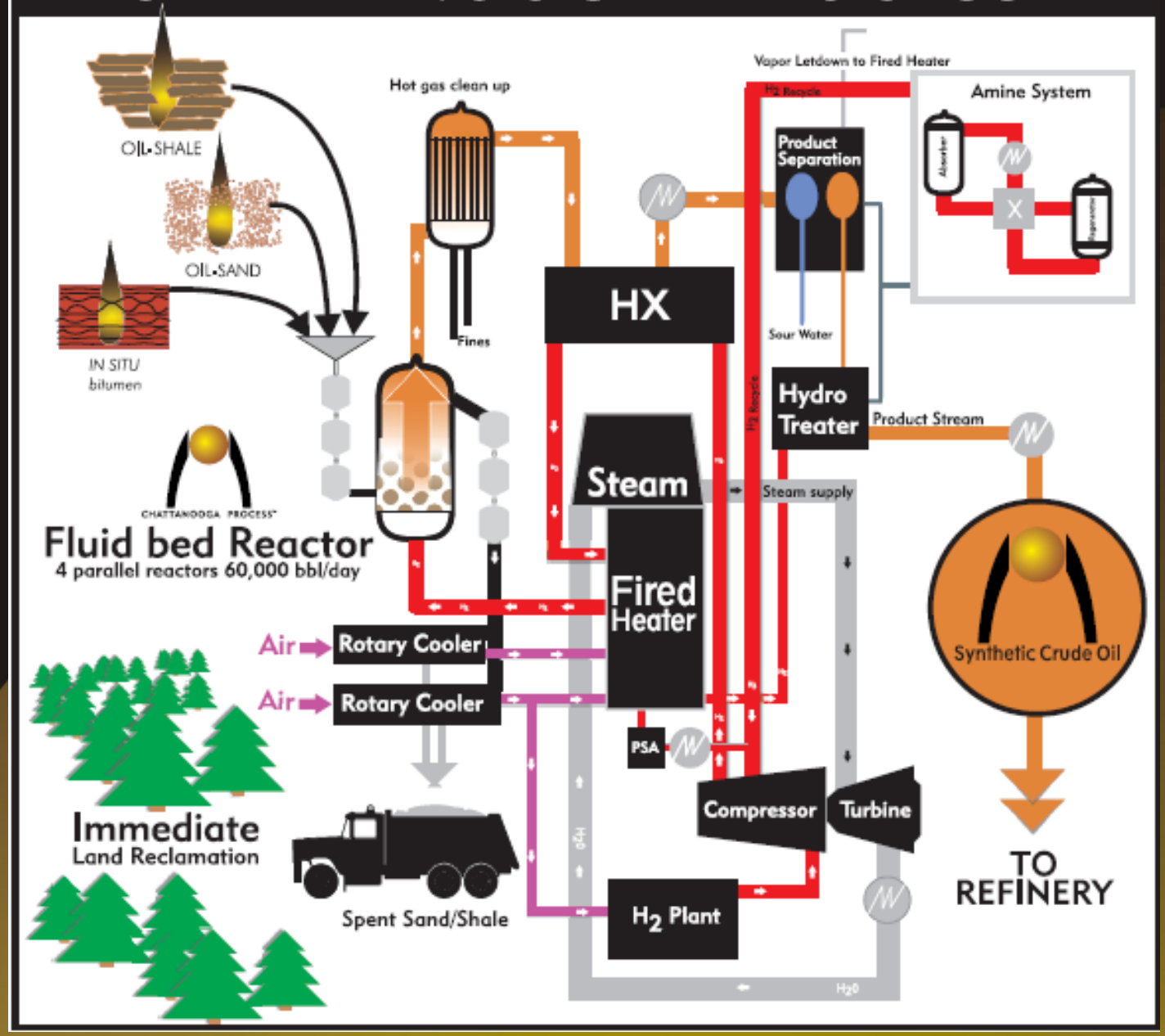

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Comparison of Processes* for Producing Oil from Oil Shale

Subject / Feature	*Chattanooga*	*Others*
Reaction vessel	Fluid bed	Retort
Heat input method for product extraction	No combustion in the reactor. Heat is introduced through heated hydrogen.	Combustion of organics in air or oxygen atmosphere in the retort itself.
CO2 Production	No CO_2 produced in the reactor. Some amounts produced in the fired heater.	Produces significant CO_2 as a result of breakdown of Calcium Carbonate.
Gas byproducts	No CO_2, NO_x or SO_x produced in the reactor. Small amounts produced in the fired heater	CO_2, NO_x or SO_x produced as a result of combustion of organic material in the retort in a air or oxygen atmosphere
Shale Decomposition (GRV)	Spent shale remains intact as Calcium Carbonate	The Calcium Carbonate is broken down into Calcium Oxide and CO_2
Land Reclamation	Spent shale suitable for immediate land reclamation. Requires minimal water for dust control.	Powder like product not practical for land reclamation. Requires significant water for dust control.
Operating Temperature	Below 1000° F	Above 1200° F
Product Yield	125-200% of Fischer Assay	80-90% of Fischer Assay
Reaction Efficiency	Demonstrated almost 100% conversion with minimal coke production	Production of coke and carbon in the retort

* excludes insitu processes

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Applications

- Oil shale
- Oil sands
- Bitumen
- Heavy oil / waste oil

Why Chattanooga ?

- "Fluid bed reacting gives 125% to 200% higher yields of oils than standard Fischer-Assay."
- "For all oil shales, major yield increases can be obtained only by adding more hydrogen to the organics."
- Optimal temperature for process: under 1000^0F

The above are the conclusions of Dr. Burt Davis, Center for Applied Energy Research

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Economic Advantages

- Lower capital and production costs
- Reduced energy requirements
- Makes smaller-volume facilities economical

Environmental Benefits

- Negligible Water Required
- No Waste Water Discharge
- No SO_2, N_{OX} or CO_2 Produced in Reactor
- Low Greenhouse Gas Emissions
- Immediate Reclamation of Mined Area

Socio-economic Benefits

- Significant job creation
- Provide additional sources of petroleum to meet increasing demand

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Results of Tests Conducted at NCUT

PILOT PLANT I:

- Proved reaction kinetics for bitumen
- 32^0 – 36^0 API

PILOT PLANT II:

- Achieved fluidization
- Extracted 100% of oil contained in oil shale

Results of Tests Conducted at NCUT

PILOT PLANT II:

Preliminary data:

Resource	Yield
Colorado Oil Shale	51.5 gal./US ton
Kentucky Oil Shale	21.0 gal./US ton

Next Steps

- Design, site and build demonstration plant
- Update design and cost estimates for commercial scale plant
- Continue developing improvements to the Chattanooga Process
- Enhance patent portfolio
- Business development

Q &A

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Chattanooga Corp

Martin J. Karpenski, CEO/President

Thank you.

Mkarpenski@aol.com

info@chattanooga-corp.com

www.chattanooga-corp.com

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