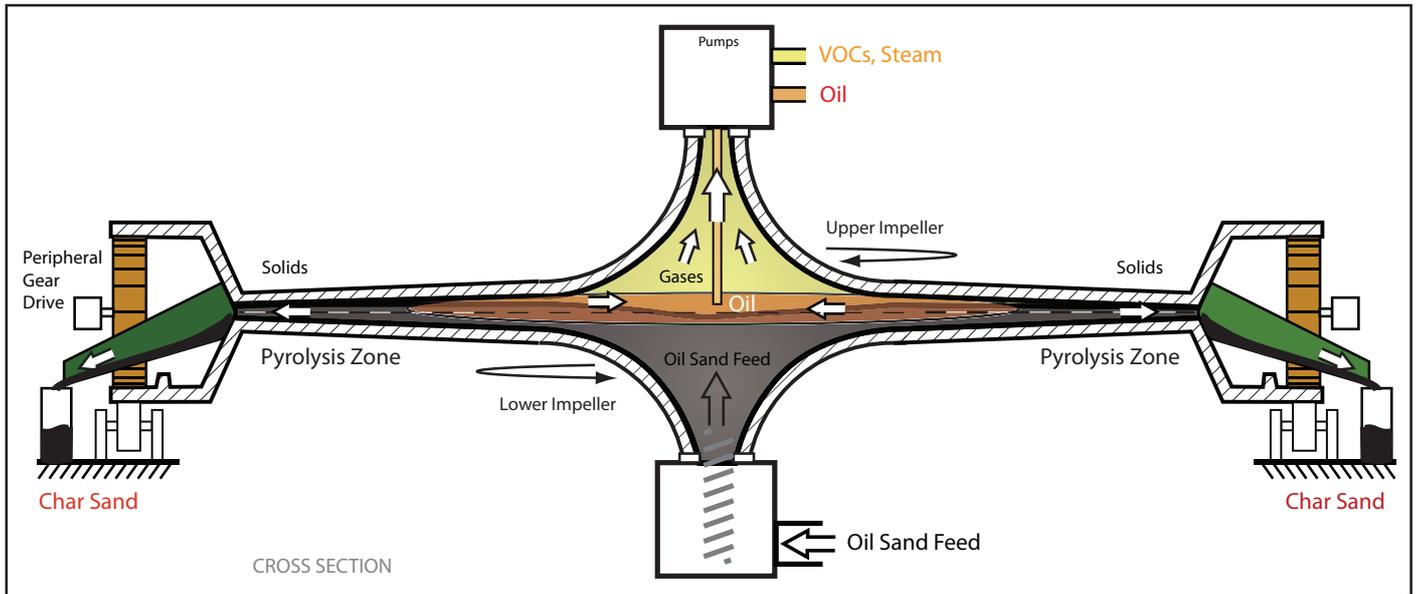


# Vorsana Shear Retort



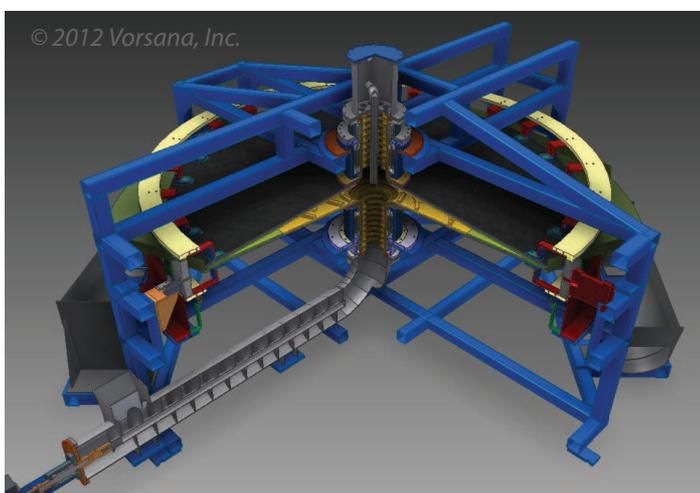
Simple and scalable, the Vorsana Shear Retort solves three problems of extraction: (1) carbon dioxide emissions, (2) water withdrawals, and (3) water pollution.

Massive counter-rotating coaxial centrifugal impellers grind and shear heat the axial feed of oil sand (or oil shale or bitumen carbonate) in a narrowing passage. There is minimal off-gassing, because the pyrolysis takes place in the contained space between the impellers. The devolatilized residue extrudes continuously as char sand, a dry mix of petcoke, sand, and clay, while liquid oil and VOC gases are axially extracted as a product stream.

Mechanical energy is used for the continuous, high volume pyrolysis and visbreaking, instead of using heat from burning fossil fuels transferred to steam, then transferred to the feedstock. Shear heating can get to higher temperatures than are possible with external steam, so the pyrolysis can be complete, down to coke. If the mechanical energy for shear heating can be provided by windmills, the extraction might avoid carbon dioxide emissions completely.

Steam is from the intrinsic water of the oil sand, instead of withdrawals of fresh water. By avoiding external steam, boiler scale is no longer a constraint, and there is no voluminous stream of poisoned water going to tailings ponds.

The residue of char sand is a soil enhancer, such as is used in terra preta soil, instead of a residue of inadequately devolatilized tailings that leach naphthenic acids, poisoning the environment. By demonstrating the transformation of tar sands to char sands, the oil sands industry can improve its public image and improve its profitability. US and international patents pending.



**Vorsana**  
RADIAL COUNTERFLOW SOLUTIONS

[www.vorsana.com](http://www.vorsana.com)

2444 SE Tibbetts St.  
Portland OR 97202  
503 477-4778

contact:  
David McCutchen, CEO  
[david@vorsana.com](mailto:david@vorsana.com)