**Pi-CO2 New Concepts in Carbon Capture**

 **Pre-Treatment, Separation, Capture & Energy Recovery**

Partnering in Innovation, Inc. introduces Pi-CO2, a completely new approach to carbon capture combining:

* In-Process Pre-Treatment (SOx, NOx, Hg, Se removal),
* Gas Separation,
* CO2 Capture, and
* Energy Recovery

Using well-known processes and standard components, in a novel configuration, the Pi-CO2 approach has proven to be a *fundamentally different, highly efficient, integrated pre-treatment and capture system capable of reducing the cost, parasitic energy, material, and scaling limitations inherent in current state-of-the-art systems.*

Building from the basics, this patented process uses well-understood principles to preferentially separate gases across a high pressure gradient. The unique design supports both pressure and heat energy recovery, resulting in a substantial offset of parasitic energy costs. This is a potentially transformational technology that uses a carbon-neutral, non-hazardous, and non-degrading physical solvent (i.e., Water) in a closed loop process.

**In-Stream Pre-Treatment & CO2 Capture:** An initial step that is unique to the patented Pi system integrates the in-stream removal of sulfur oxides (SOx), nitrogen oxides (NOx), mercury (Hg) and other metals. This is significant as it greatly reduces capital costs relative to a system with separate pre-treatment and capture systems. This is a potential ‘game changer’ for the carbon capture cost model.

**How it Works -- Low Risk, Gas-Lift Driven, No Moving Parts:** Compressed emission gas is injected into the system at depth. The water and mixed gas stream circulate through a patented cascading absorber that is either suspended in a sealed, water filled, shaft - or suspended from an offshore platform. The system is closed loop with multiple heat and compression energy recovery steps combining to greatly reduce the net parasitic energy costs.

There are no moving parts in the submersed absorber system. Water circulation is driven by gas-lift pumping where the effervescing gas is balanced by high pressure emission gas injection, setting up a self-maintaining circulation system. The CO2 is separated from the water in a simple gas-water separator prior to drying and compression to pipeline pressures.

**Results:**  Pi-CO2 uses standard equipment and has no specialty materials, no complex processes, and no material or scale limitations. Leveraging a substantial base of prior work and 3rd party review, this technology offers:

* **Feasible, efficient thermodynamics;**
* **Predicted capture of >95% CO2 from the flue gas;**
* **Low Cost with separation of nearly pure (> 96%) streams of CO2 and N2;**
* ***Net by-product of* power and steam (including product compression to pipeline pressures); and**
* **Predicted net CO2 reduction of >82% with <18% net parasitic energy.**

The Pi-CO2 approach is directly relevant to both post-combustion emission capture (e.g., coal-fired, refinery, upgrader, cement, smelter, etc.), and CO2 separation from natural gas reserves (offshore and onshore).