Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

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Bundle of High Efficiency Vortex Tube Cooler for Air/Gas Drilling

Drilling oil wells is an expensive proposition. Rig rental can cost as much as $500,000 per day. The drill bits must be kept cool or the bits quickly become dull, causing the bit to drill slowly. When rock is heated the surface of the rock becomes more plastic, which slows drilling. The bit can be cooled with fluids which also helps to bring the broken rock pieces up to the surface. Unfortunately, the fluid exerts high pressures on the rock and slows the drilling process. Air pressure can be used to remove the rock chips, particularly when the well is shallow, but compressed air does little to cool the drill bit or the rock surface. A solution is needed that can both cool the drill bit and the rock surface, while at the same time removing the rock chips without adding pressure to the rock surface and slowing the drilling process.

Researchers at Arizona State University have developed a low-maintenance, low-cost cooling device made from a bundle of vortex tubes. Compressed air is forced through a bundle of vortex tubes. Each tube creates a vortex separating the hot and cold air. The device allows cold air to be injected into a drilling shaft, bringing the rock chips to the surface without putting significant pressure on the rock surface. The cold air cools the drill bit and rock surface at the same time. When the rock is cool, it speeds the drilling process because cool rock is more brittle. The innovation increases the life of the drill bit and reduces the cost of drilling wells by increasing drilling speed.

Potential Applications

- Oil and gas wells
- Exploration wells
- Water wells

Benefits and Advantages

- Lower Costs – Reduces drilling rig rental cost
- More Power – Increases drilling speed
- Retrofit – Works with existing drill rigs

For more information about the inventor(s) and their research, please see Dr. Kangping Chen's directory webpage