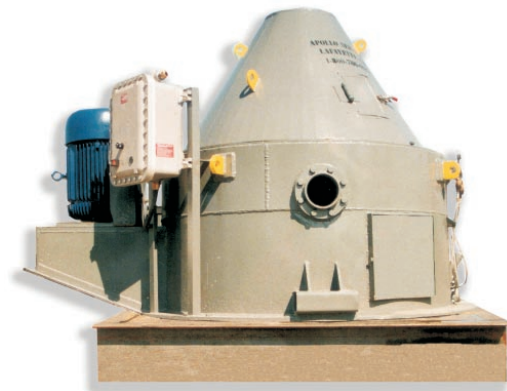


# Cuttings dryer system exceeds EPA requirements

**NEW DRILL CUTTINGS DRYER** technology can meet US limits on fluids in drill cuttings with room to spare.

The **US Environmental Protection Agency** has set the discharge limit to 6.9% fluids by weight or better for input/output synthetics and 9.4% by weight or better for esters.

**Apollo Services** has worked with various operators since 1995 to develop best management practices and best available technology for drying discharged drill cuttings in order to reduce the environmental impact of synthetic fluids.



**Figure 1:** Cuttings dryer mounts directly on deck. 7 ft high, 82 in. wide, weighing 16,000 lb, it can process 40 tons/hr.

Apollo's newest cuttings dryer, the Typhoon, is a vertical centrifuge that "dries" the cuttings with the highest centrifugal force in the industry. The result is cuttings dried to as low as 0.67% fluids by weight.

This performance allows our clients to stay well below the EPA mandate. Apollo provides the best available technology—the driest cuttings and the largest safety net (up to 6.23%) in the industry.

Advantages of the Typhoon dryer include:

- Driest cuttings retention of <2%, average 1.8%;
- Patented Continuous Vacuum Discharge Hoppers, 100% redundancy;
- Recovers/recycles all mud from cuttings;
- Increases solids removal efficiency, reduces dilution costs;

- Reduces space requirement and fits virtually any rig;
- Reduces haul off volumes and disposal and treatment costs;
- Reduces rig impact—smaller, simpler to install and operate;
- Experienced Mud Police manage cuttings program;
- Single source integrated package price.

## SYSTEM FEATURES

The cuttings dryers run behind the rig solids control system. This allows the rig shakers to be run with finer screens, resulting in increased drill solids removal efficiency. Increased drill solids removal efficiency saves significant dilution costs, reduces drilling days, and aids in substantially lowering hole problem costs, fines penetration into producing sands, etc.

Any additional mud lost over the shakers is collected by the cuttings dryer and returned to the active mud system after centrifuging out the drill solids that have been concentrated in a small volume and can now more easily be taken out with centrifuges. The effluent of the Typhoon is processed through a special high-speed centrifuge to clean the recovered mud.

Reducing deck space requirements for cuttings dryers has been a challenge for clients. Figure 1 shows an Apollo Services technology patent which reduces deck space requirements for our cuttings dryer by 50% over competitive designs.

## TRANSFER SYSTEM

Many of the problems encountered with other cuttings dryer systems are actually problems

with the cuttings transfer systems. Apollo's patented Continuous Vacuum Discharge Hopper (CVDH) feed system offers an important advantage.

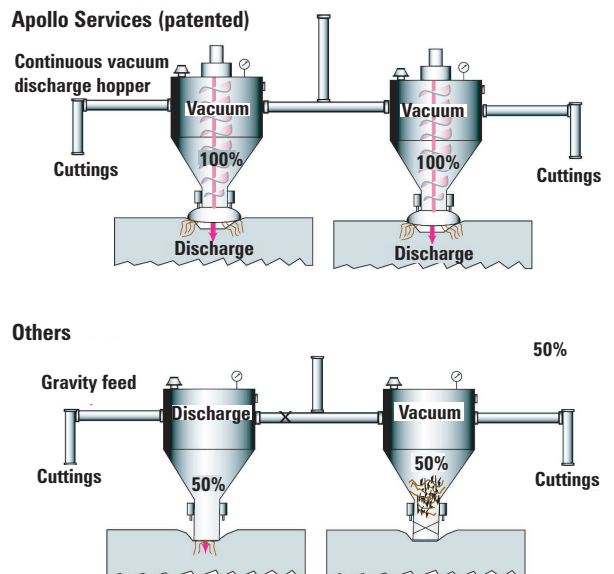
Apollo has been using the Continuous Vacuum Discharge Hoppers since 1995 to feed its cuttings injection units, cuttings dryers, and cuttings boxes at rates of over a mile of hole drilled per day with no downtime.

This same vacuum cuttings conveyance rate has been achieved on 5 different Unocal wells, including the Unocal-Spirit Energy 76 drilling project West Cameron 196 on High Island IV, in a combined rig effort that drilled more than one mile in a single day.

Apollo's CVDH utilizes a forced feed screw design to provide 100% redundancy because each hopper vacuums and discharges continuously. Other systems use two gravity feed hoppers with no redundancy, because they need one sealed gravity feed hopper to vacuum cuttings, while the other gravity feed hopper attempts to discharge sticky drill cuttings (switching back and forth between the two). Therefore, two gravity feed hoppers only provide 50% capacity each.

Each of our CVDH provides 100% capacity; using two units will provide 200% capacity.

**Figure 2: Systems compared**



Apollo's CVDH system is used to continuously vacuum cuttings while the screw auger forces the cuttings out of the hopper.

While the auger is forcing out the cuttings, the choke plate is pulled against a seal at the bottom of the hopper to hold a continuous vacuum. As the drill cuttings are pushed against the choke plate, the cuttings push the choke plate

down and flow around the choke plate. In this instance, the cuttings form the seal. The more cuttings being processed in the CVDH, the better the system works.

The amount of drill cuttings that is being processed out of the CVDH is regulated by adjusting the pressure of the pneumatic cylinders that control the choke plate and the auger RPMs.



**Cuttings are shown from drilling through sand (left) and from drilling through a shale section.**

The steady feed rate of the patented Continuous Vacuum Discharge system has been proven to provide the advantage in processing the driest discharged drill cuttings in the industry. Other systems can only feed dryers in batches, cycling from one gravity dump pod to another.

For safety, ease of installation and to keep installation costs low, Apollo utilizes a 100-hp vacuum system and the patented CVDH. Apollo's system makes it possible to run only a hose into the shaker room and to vacuum the cuttings to a point on the rig that is unused.

Screw conveyors can be rigged up to feed cuttings dryers in those applications that dictate screw conveyers. However, screw conveyors do degrade drill cuttings and increase the oil retention on cuttings by increasing the surface area and the low gravity solids retained in the recovered mud.

A key part of our service is providing Experienced Mud Police to consult, measure, and document best management practices to ensure that our clients stay well below the EPA discharge limit. Additionally the same personnel that manage the cuttings dryers also install and maintain our other zero discharge equipment.

Apollo continues to grow and lead the industry in introducing new technology. The company operates 58 cuttings dryers, 26 cutting injection units and over 100 cutting vacuum transfer systems.

Safety is a top priority. With over 200 professionals located around the world, Apollo's objective is Health, Safety & Environmental excellence. It maintains a 0.95 Experience Modification Number with over 756,372 man-hours worked in year 2000. ■