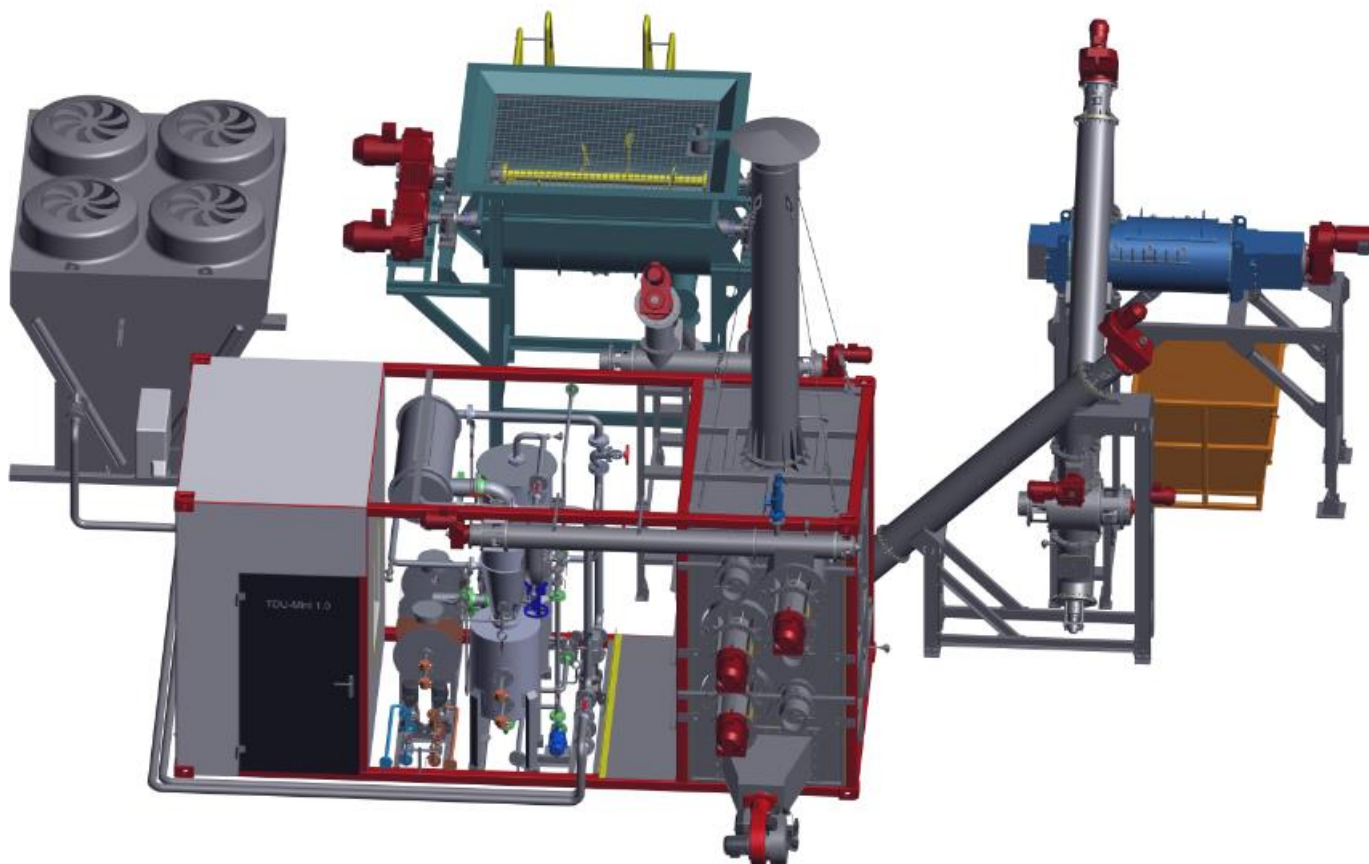


TDU-MINI NEW TYPE OF MOBILE THERMAL DESORPTION UNIT



Developed in 2018

System of drill cuttings thermal treatment (TDU-Mini 1.0) provides treatment up to 1 ton/hour of drill cuttings and further separation into three recovered fractions: oil (mineral or synthetic oil, fluid paraffin, diesel fuel), water and solid phase.



- Hydrocarbons content: 10% of weight
- Water content: 10% of weight
- Solid phase content: 80% of weight

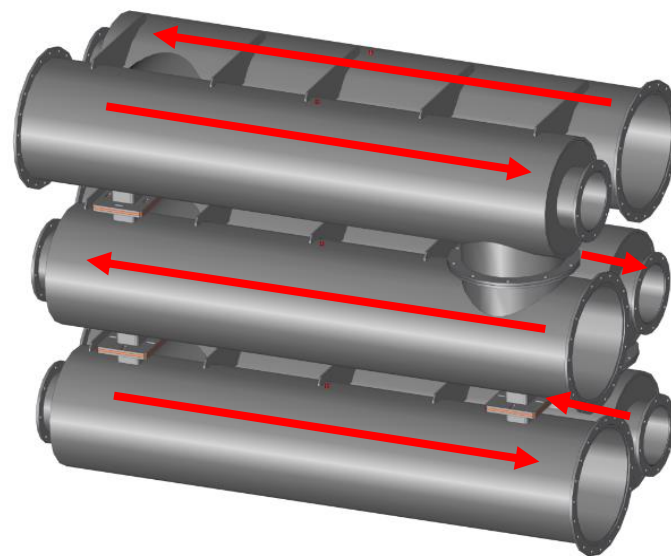
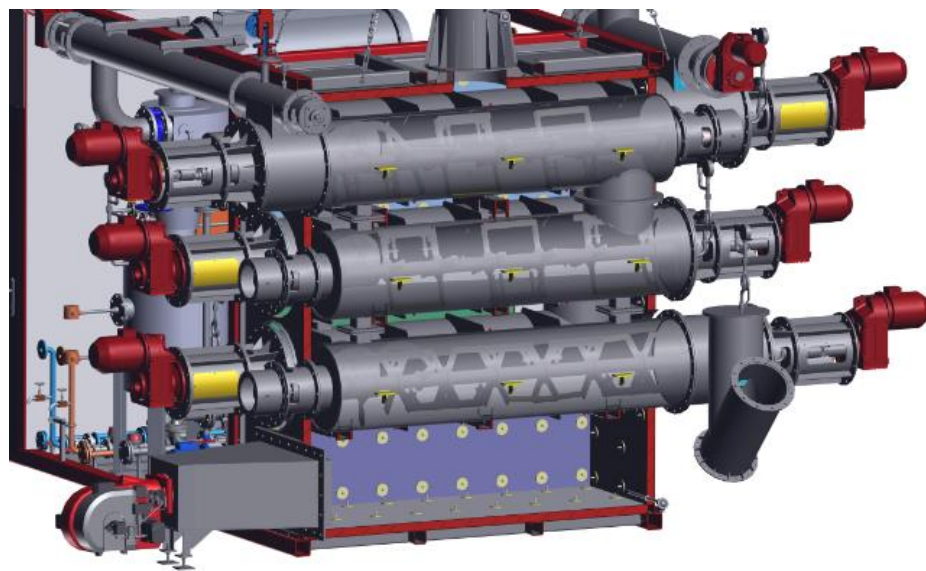
Output material after treatment:



- Dry solids containing maximum 0.5%...0.01% of hydrocarbon
- Recovered oil
- Processed water

- Hopper with the capacity of 2.5 m³ is used for dry bulk, liquid and viscous drill cuttings. Material in feed hopper prevents entry of air into desorption chamber allowing to isolate drying process from entry of oxygen and avoid gas ignition
- Feed conveyor is designed based on consistency of treated material which makes it possible to feed bulk material and material with any viscosity.
- Feed rate is controlled by control system which provides required volume of feed material in desorption chamber to maintain desired operating temperature and stable treatment process.

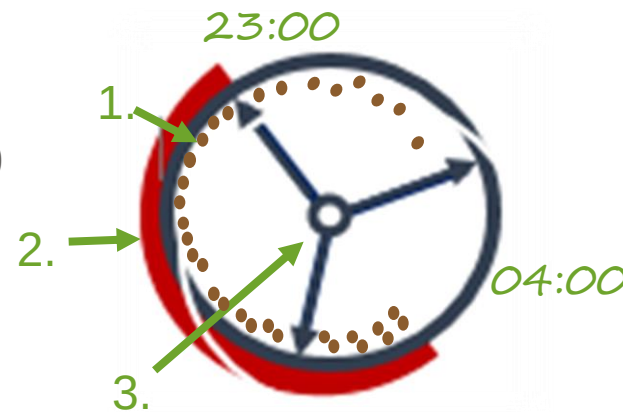




- There are 6 pipes each one more than 2 meters long.
- Compact design of three level process chambers allows to heat material at different temperature rates.
- Maximum efficiency of distribution heat into firebox allows to increase process rate. Expected temperatures- of top level 100-200 C, middle 250-350C and bottom 450-550 C.

Treatment process of drill cuttings can be explained in the following way

1. Here is a chamber where material dries up via heat exchanging with chamber walls.
2. Red color marks show heated zone of the chamber. Drill cuttings are moving clockwise from 4:30 to 22 :00 - it is a work zone of maximum heat exchange. From 23:00 to 4:00 is a work zone of minimum heat exchange. Red zone is heated more than the rest of the chamber to keep stable heat around the chamber.
3. Here is a new type of main screw auger, designed to move material around chamber. Screw auger has been developed in three years time. The advantage is that the screw rotates fluffing drill cuttings inside the chamber at an average speed. This auger screw allows drill cuttings to get dry fast. Regular screw auger does the same job three times less than our new screw auger.



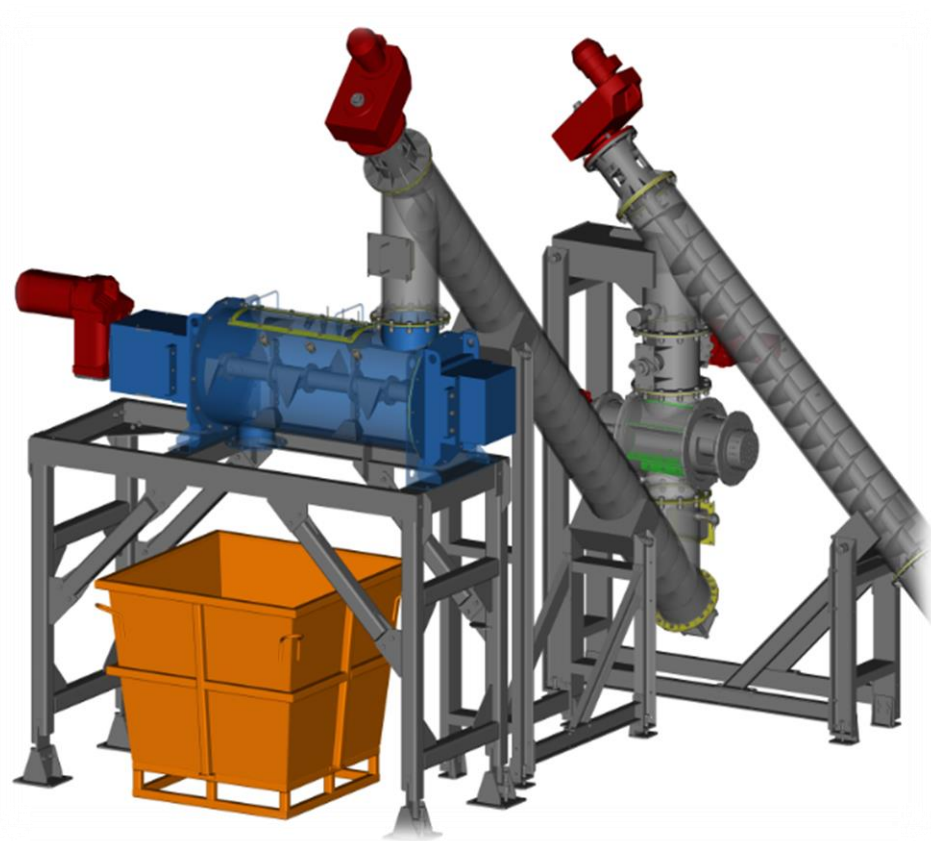
TDU-Mini 1.0

New type of Screw Auger



- Clogging drill cuttings is the most common cause of regular screw auger.
- Our new design allows screw auger to be always clean during the process.
- Advantage of using new screw auger is stable process of any drill cuttings and less downtime.

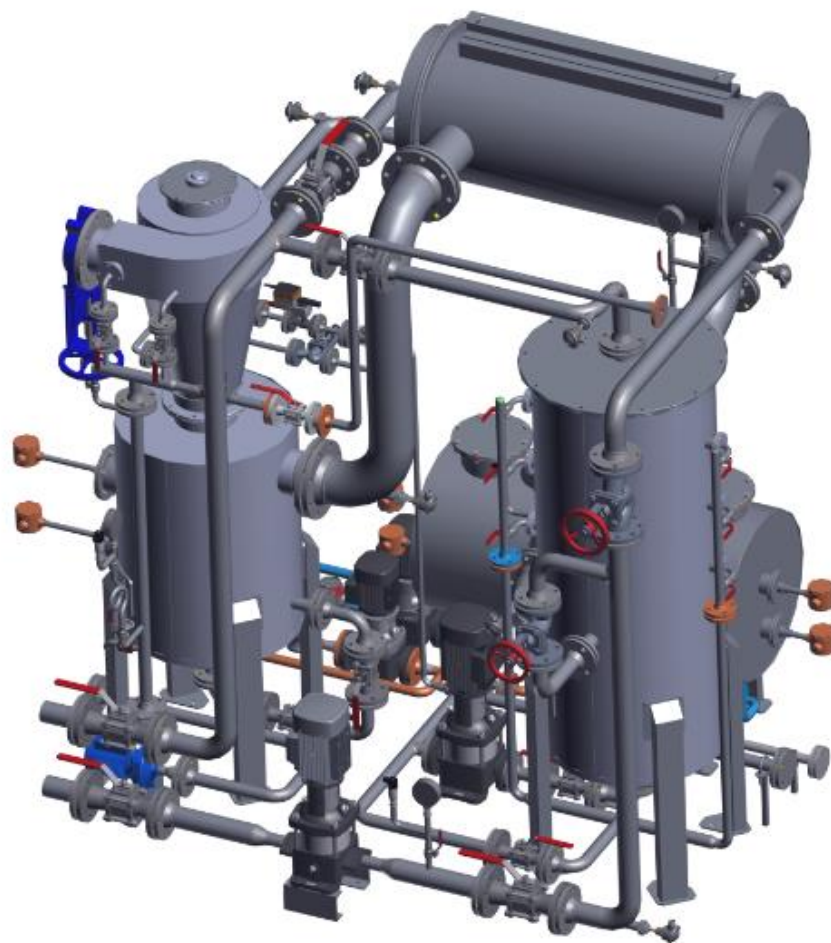
- Discharge system is designed to remove dry solids the safe way. There is always level of dry solids into outlet box which serves as a seal to block air entry into the chamber.
- Rehydration mill is designed to wet dry solids a little bit to avoid spreading dust around the work zone.
- There is also additional extruder can be used. Dry solids can be pelletized and then used by a Client for road filling or site area preparation



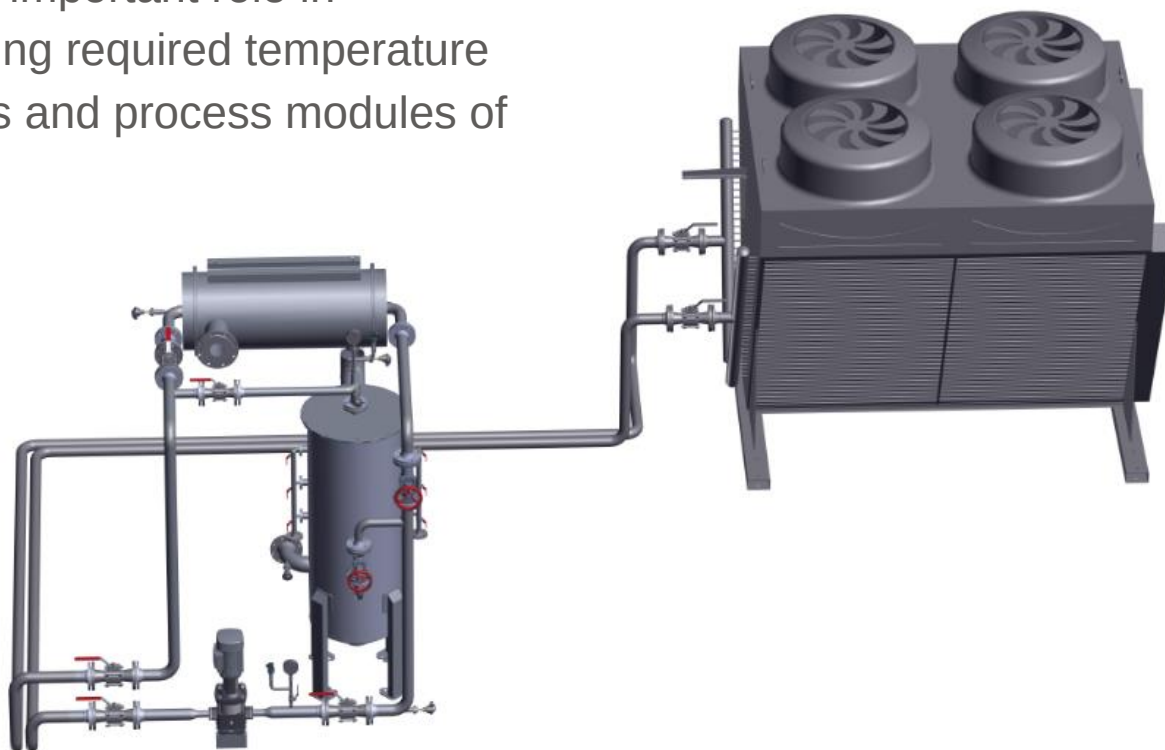
TDU-Mini 1.0

Oil condenser & Oil and Water separator

- Gas cleaning screw is designed to clean gas line during process. Cleaning screw allows to reduce volume of dust to 50% before it reaches Scrubber.
- New design of Scrubber allows to clean gas from ultrafine particles.
- New design of condenser is compact, maximum effective and easy to maintain.
- New combine oil condenser
- Gravity oil and water separator
- New design gate valve allows to isolate condenser from chamber during the maintenance.



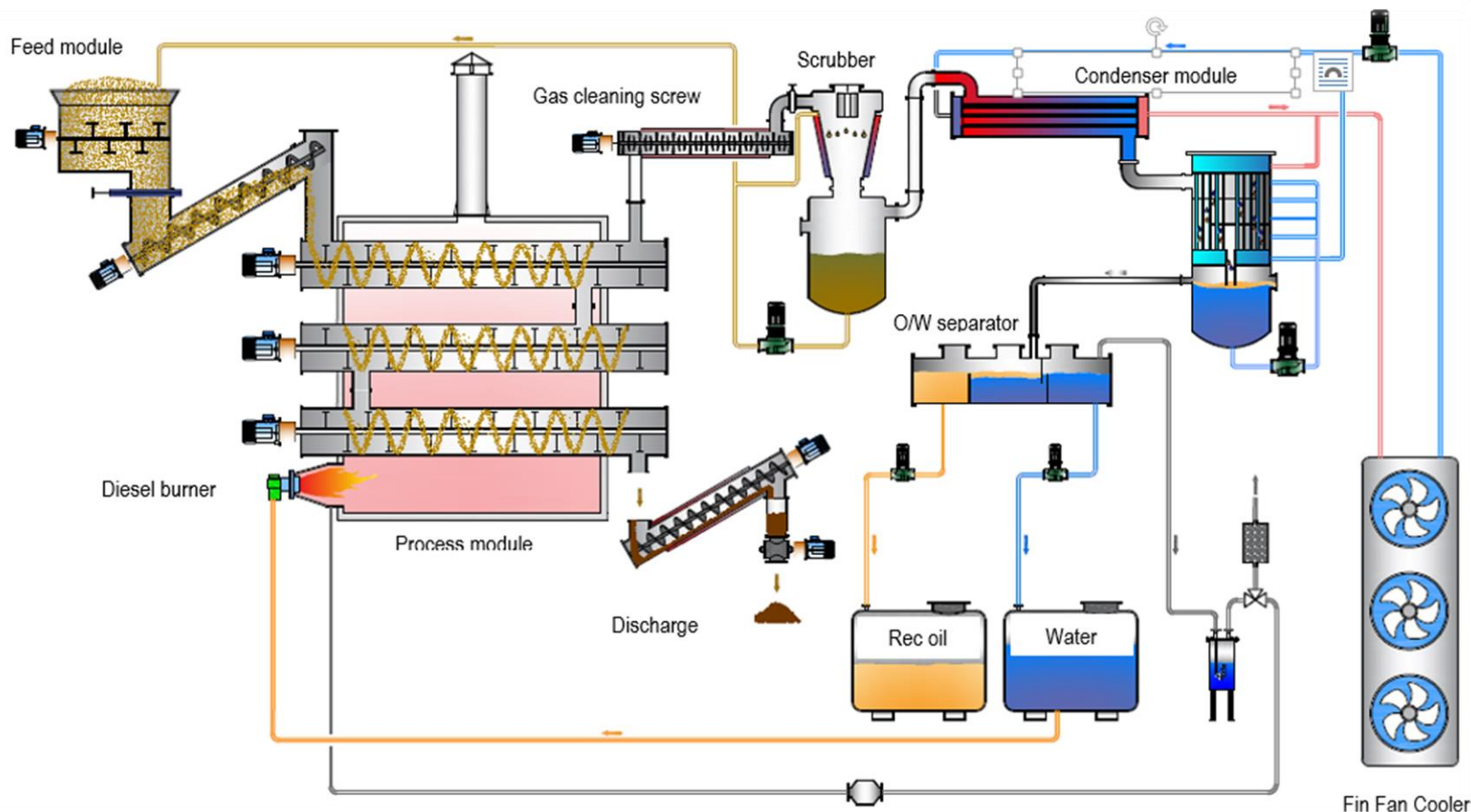
- Cooling system plays an important role in technical process providing required temperature conditions for all systems and process modules of the unit.
- Temperature sensor of cooling system is displayed on control panel and operator can control operation of cooling system.



- Control panel is installed in control room and is managed by control system Supervisory Control and Data Acquisition (SCADA).
- TDU-Mini 1.0 is operated in automatic mode.
- Also distribution panels of electrical equipment of all systems, modules and PLC control panels are located in control room.
- The unit is equipped with audible and visual alarm so operator can immediately respond to any emergency



Flow diagram of TDU-Mini 1.0 process



Advantage

Technical process of drill cuttings treatment includes heating of desorption chambers by diesel burners. It allows to minimize power consumption resulting in reduction of economic resources cost.

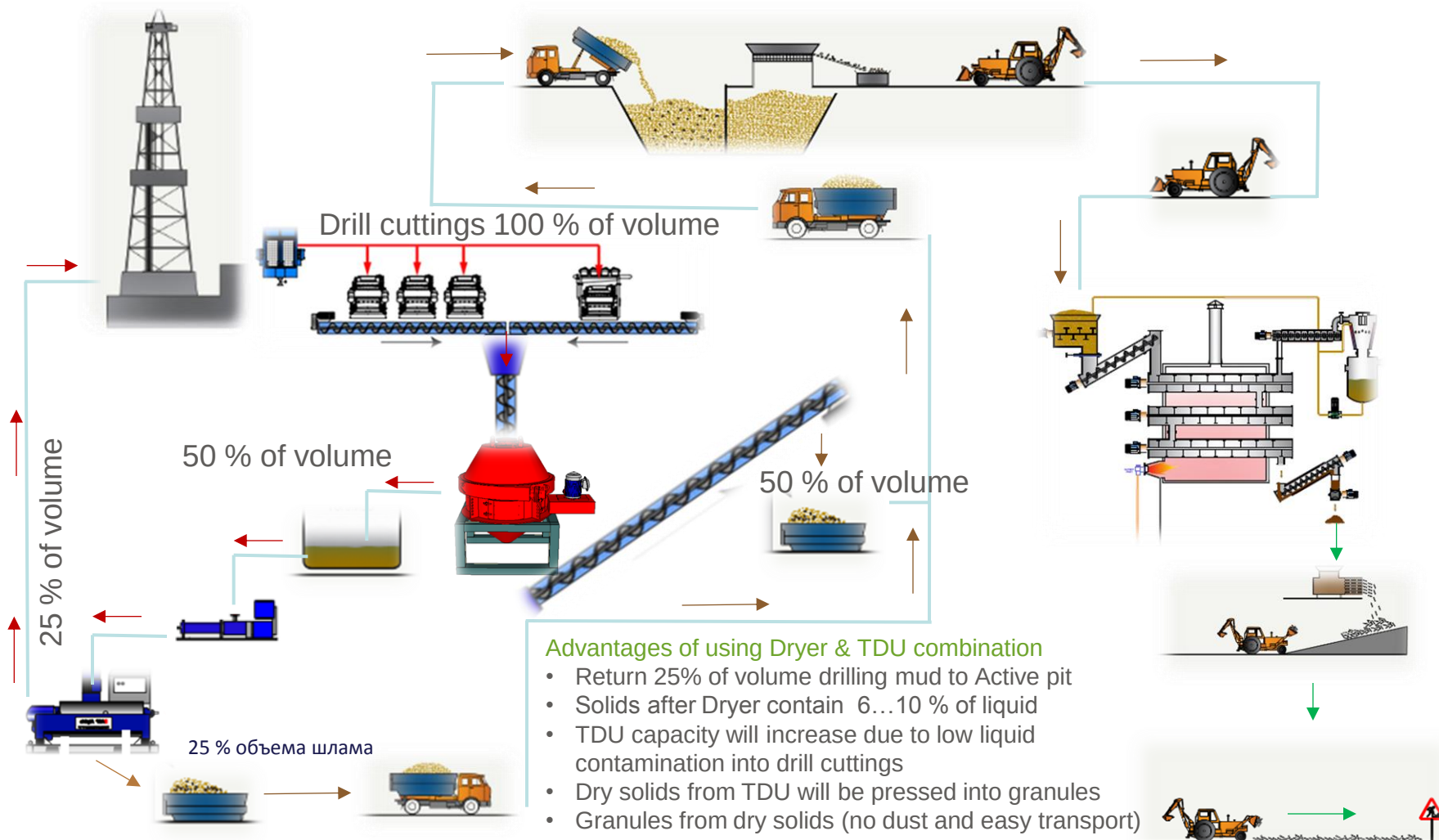
The unit is designed so that fuel (oil, mineral or synthetic oil, fluid paraffin, diesel fuel) recovered during treatment can be used for burners operation making the whole treatment process much cheaper.

It shall also be noted that the whole technical process of treatment is totally enclosed.

It's a mobile and compact unit able to move in 24 hours time.

Two operators require to run and maintain TDU-Mini per shift.

24 hours control, video monitoring of equipment, parameters online check



Additional equipment depends on climate zone

1. Equipment to feed hopper
2. Energy 60 KW
3. Storage tank for process water
4. Storage tank for recovered oil
5. Diesel tank
6. Equipment to move dry solids or pellets
7. Truck to transport recover oil
8. Equipment to treat processed water to be able to reuse it

