

MINI MECHANICAL HYDRAULIC PUMPING UNIT

The mini mechanical hydraulic pumping unit represents a very efficient technological development given that it is a machine with 120 inches of travel, operated with motors from 2 hp to 7.5 hp for pound forces between 4,000 and 23,000 applied in the polished rod, which has a maximum travel of 120 inches and a maximum speed of one cycle per minute.

The high energy efficiency of this machine is due to the fact that it rises very slowly and falls very quickly. For example, lift time for 120 inches of travel is 55 seconds, and fall time for 20 inches of travel is 5 seconds. This is the same principle that unitorque units use, being able to decrease the power needed for operation since they rise 20% more slowly than they fall, only in this case the MINI unit rises 94% more slowly than the time it takes to fall. This is why the power requirement for these machines is lower.

The units are comprised of a hydraulic power unit, a pedestal and a hydraulic actuator. They weigh between 400 and 700 kilograms, thus making them very easy to transport and install. They do not need concrete bases or attachment systems for the pedestal, such as stays.

As a result of the useable area of the piston which is found inside the hydraulic actuator being constant and known, it is very easy to determine the force that the machine exerts on the polished rod since it has a gauge to identify the pressure exerted by the hydraulic system ($F = P \times A$), to lift the piston rod of the hydraulic actuator, which is connected to the rod string. This allows for:

1. Detecting if the rod string is disconnected.
2. Detecting if the subsoil pump is stuck.

3. Identifying the dynamic level the subsoil pump is submerged at.



UHBM-MINI Remanso 1 wel

These machines are able to change speeds in an asymmetric way, by rising at one speed and falling at another, without the need for frequency drivers. The range of speed variation of the MINI is between 0.1 and 1 cycle per minute. The travel can also be adjusted by changing the position of the final track sensors, which can be moved even by millimeters. Thus, the maximum travel of the machine is 120 inches and the minimum is 12 inches. What is more, this adjustment of the travel can be done asymmetrically and in any part of the pedestal, which enables the optimization of the spacing of the subsoil pump.

This technology is applied in wells of low potential because for a well with a 4,000-foot pump, you only need a 4 hp machine to produce 40 barrels per day, with a maximum speed of one cycle per minute.

Due to the low cost of these machines and their high energy efficiency, the extraction of hydrocarbons in mature or inactive fields is made viable, even more so when they move at such low speeds since the wear on the steel of the rods is diminished, increasing the working lifespan of the whole subsoil system.

As can be seen in the photo (UHBM-MINI Remanso 1 well), the mini mechanical hydraulic pumping units are installed in the centre of the well, and for this reason they are self-centering and minimize installation time to an hour.

Finally, it is important to mention that this technology has been put in use by SERINPET for the last ten years, thus making it the only Colombian company that has faced the challenge of developing and building new technologies for the artificial lifting of hydrocarbons.