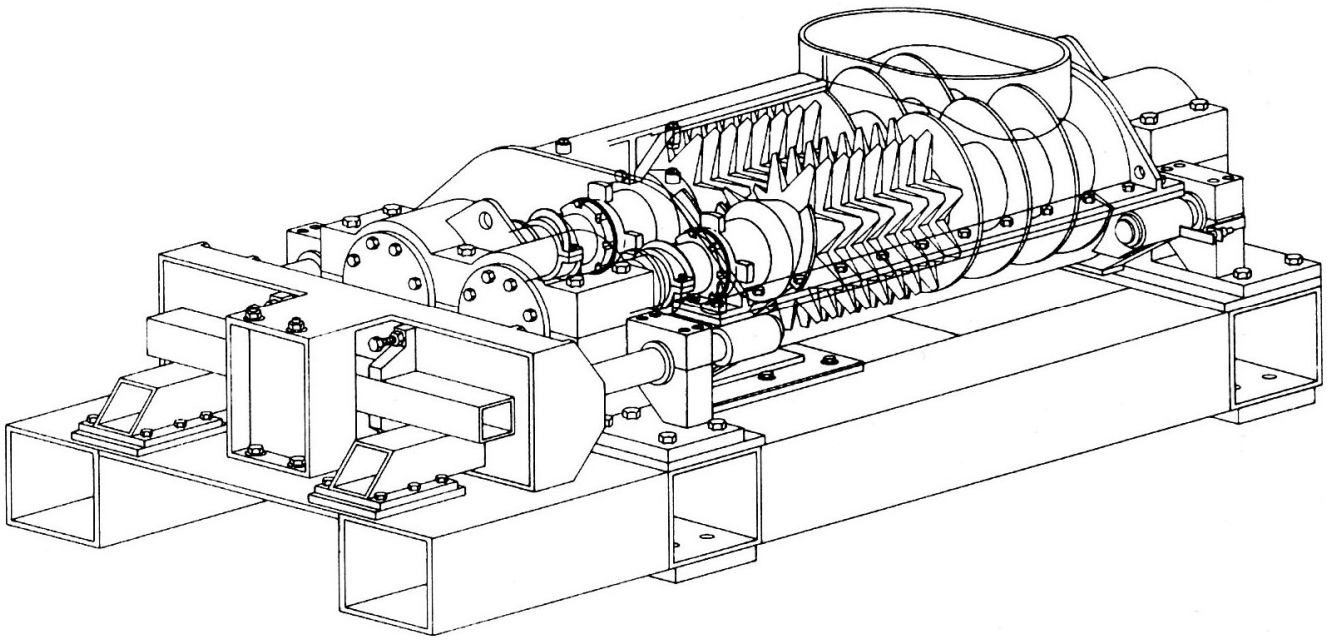
MDR1000



General

The MDR is a machine for treatment of pulp, consisting of two counter-rotating shafts, equipped with exchangeable feed screws and at the inlet end of the shafts and exchangeable kneading screws in the main part. These kneading screws are the essential working zone of the MDR where the mechanical treatment of the pulp is carried out.

The pulp is brought into the feed screws of the MDR at a consistency of normally 25-35% through an inlet and is then forwarded by the feed screws to the treatment zone. After passing the treatment zone the pulp is pressed out of the housing through a ring-shaped gap and falls down into a subsequent conveyor or tank.

Function

The letters M_D_R are an abbreviation for the words Mixer, Disperser, Refiner. The amount of energy imparted by the kneading screws essentially determine whether the MDR is Mixing, Dispersing or Refining

The MDR is carrying out a treatment with the pulp that can be called inter and intrafibrillary kneading. The essential part of the treatment is done through interaction between the fibers.

A necessary requirement to reach the preferred effect of the treatment is that the consistency is high enough, which means in the 28-30% region or higher. At these consistency levels the friction between the kneading screws and the pulp will be greater than between the single fibers. The fibers will, therefore, be twisted and rubbed against each other.

Through inter and intrafibrillary actions the fibers are treated in such a way that their characteristics will be changed in different aspects. Some of them will be compressed and collapse and obtain more or less permanent folds. Stiffer fibers will be softened and resin in fiber capillaries will be pressed out and be made more accessible for chemical treatment.

When used for Mixing and chemical treatment, the kneading leads to a positive influence on many properties of the paper. For instance, tear, strength, stretch and folding endurance are all increased and in addition the drainage capacity is increased. At the so called “mechanical deresination” closed-in resin will be made more accessible for alkaline dissolution at the same time as the chemical consumption in subsequent bleaching stage is decreased.

When used for Dispersion of ink, the kneading of the pulp fibers dislodges ink particles from the fibers. Furthermore, the rubbing of the fibers together results in fragmentation of ink particles that are trapped between the fibers. The fragmentation of the ink particle provides complete dispersion.

The MDR is used also in other processes for fiber treatment, like upgrading of rejects and refining of high yield pulp.

For these processes, it means that the strength properties and softness are positively influenced so that the treatment at unchanged properties can usually be increased considerably in comparison with pulps which are only refined with disc refiners.

Design

The MDR consists of two counter-rotating shafts equipped with feed screws. The ends of the shafts consist of exchangeable kneading screws with rifle-patterned flanks applied in helical form in order to create tight gaps between the flanks at rotation.

An axially movable housing surrounds the shafts. In this way, the outlet opening from the treatment zone can be varied and consequently also the counter-pressure in the zone. The inlet into the machine is done through a flexible connection between the housing and the inlet pipe.

The rotation of the shafts is created by an electric motor via a water-cooled speed reducer so that the shafts are synchronously driven in counter-rotation at a speed of about 900 rpm. The shafts are supported in roller bearings at both ends and are connected with the two outgoing shafts of the gearbox with flexible gear type couplings.

The treatment zone of the MDR consists of two exchangeable, stainless steel kneading screws. Both these kneading screws and the feed screws are fixed to the shafts with clamping (taper) rings and in this way also easily exchangeable. The kneading screws have a low pitch and are slotted so they get a cross-section of 12-pointed stars. The tips or flanks have a rifle-pattern so they will give an efficient grip at the pulp during the treatment.

An integrated oil pump continuously cools the oil in the gearbox. The bearings of the shafts are grease-lubricated.

For the control of the counter-pressure, in the outlet of the MDR, there is a load controller with pneumatic bellows, which control the position of the movable housing and in this way also the size of the outlet opening from the treatment zone

The main machine is mounted on a stiff, fabricated mild steel frame, which is fixed to the concrete inertia block (base) together with the gearbox. For shock and vibration absorption, the concrete inertia block is arranged on a number of rubber blocks