dredged material in hoppers and upon reaching the disposal site, to discharge
the cargo through bottom dumping hopper doors. During the last two decades, due
to the need for beach nourishment, a number of hopper dredges have been modified
to include a capability to pump out the hulls and complete the delivery to the
beach or nearshore area via a pipeline.

Pipeline dredges are rated by the size of their discharge lines (or pipes)
and the rate of sand discharge varies substantially with pipe size. The
approximate range of pipe sizes is 15 cm to 120 cm with corresponding pumping
rates from 50 cubic meters per hour to 3,000 cubic meters per hour. Thus the
size of a project will dictate, to some degree, the size of the equipment. As
an example, a project requiring dredging of 1,000,000 cubic meters would usually
result in contracting a dredge of 60 cm diameter, i.e. approximately 1,000 hrs
of required pumping time.

The elements of a pipeline dredge include an intake pipe mounted on a
"ladder", a dredge pump and a discharge line to the placement area. The sediment
to be pumped can be mobilized by jets of water in which case the dredge is called
a "suction head" dredge (Figure 18) or if sediment mobilization is caused by a
rotating cutter head, the appellation "cutter head" dredge is used, Figure 19.
The ladder can be moved both horizontally and vertically to access more sediment
while the dredge is in a fixed location. The dredge pump is mounted on a barge
and is a centrifugal type pump with hardened elements to resist wear caused by
the pumped sand. The discharge line connects to the outlet of the pump and this
line, generally in segments of 10 m length or greater, transports the sand to
the point of delivery. If the discharge line is so long that the power supplied
by the dredge pump will not transport the slurry at sufficiently high velocities,
it may be necessary to install "booster" pumps periodically along the pipeline
with a booster pump every mile or so for smaller pipelines and booster pumps
every two to three miles for the larger pipelines. Pumping over distances in
excess of 20 km have been accomplished. It is necessary to maintain velocities
above the sediment settling values or else there is a risk of deposition
occurring in the pipeline leading to its eventual plugging. Since settling
velocity increases with size of the sediment particles, the larger the size, the
greater the required water velocity in the pipeline. Typical pipeline slurries