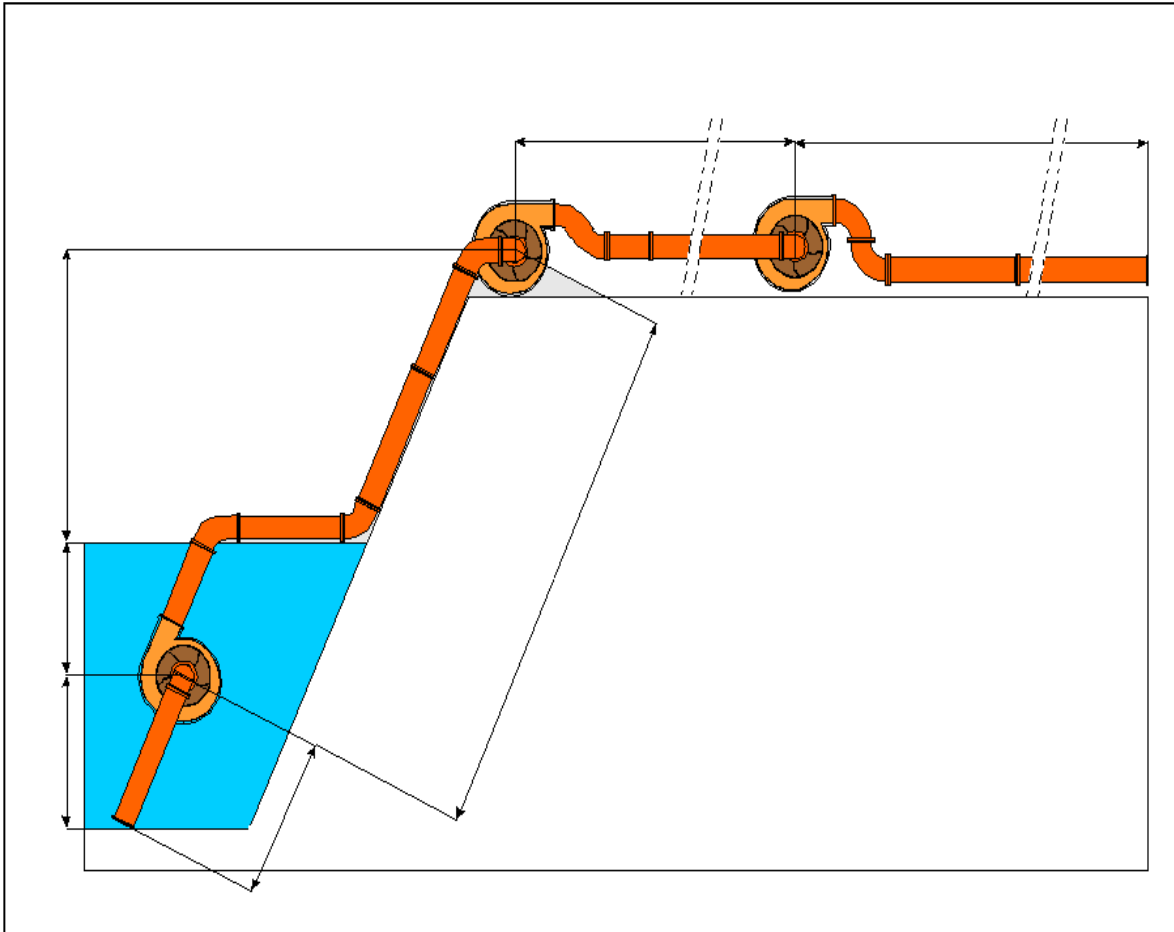


***DREDGE PUMPS  
AND SLURRY TRANSPORT***

***OE4625***





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# PREFACE

These lecture notes cover two parts of the course OE4625 “Dredge Pumps and Slurry Transport”:

- the hydraulic transport of solids in pipelines and
- the co-operation of pumps and pipeline in a hydraulic dredging system.

An aim of these lecture notes is not only to review the basic rules and models for handling mixture transport in dredging installations but also to explain the physical processes governing the mixture transport and their description in predictive models.

The lecture notes contain all information required to pass an examination on the studied subjects. Principles of mixture flow through a dredging installation are described using various models in these lecture notes. For the examination an application of one of the models (preferably the best one to solve the specific problem) is sufficient.







# INTRODUCTION

A dredging cycle of a hydraulic dredging system is composed of the following processes:

- the disintegration of soil at the bottom of a waterway or in a borrowing pit
- the mixture forming in a cutter head or in a suction head of a dredge
- the transport of a solid-liquid mixture through an inclined (or vertical) pipeline to the board of a dredge
- the loading of a dredge hopper with a mixture *or* the transport of a mixture in a mostly horizontal pipeline from the board of a dredge to a deposit site
- the deposition of dredged solids, i.e. the unloading of a hopper *or* the storing of solids in a deposit site at the end of a mostly horizontal pipeline.



In the lecture notes attention is focused to the transport of mixture in both an inclined (or vertical) pipeline connecting the bottom of a waterway or a borrowing pit with the board of a dredge and a horizontal pipeline between the board of a dredge and a deposit site.

## **Principles of flow of soil-water mixture in pipelines**

The characteristics describing a flow of mixture in a pipeline connected with a dredge are of a major importance for a safety and an economy of a dredging operation. They indicate whether the transportation is carried out in a regime that avoids a danger of a pipeline blockage and they determine the amount of soil that can be transported together with the energy dissipated in the flow to transport the required amount of soil through a pipeline. Mechanisms governing the mixture flow in a pipeline and their prediction using models are discussed in the first part of these lecture notes. An aim is to describe the pipeline flow characteristics for various chosen mixture velocities and soil concentrations and this for soils of various particle sizes and pipelines of various diameters.



## **Co-operation between pumps and pipeline to transport soil-water mixtures**

The energy is provided to a pipeline flow by pumps. A combination of the pipeline and the pump characteristics determines a behavior of a dredging system and a production of solids by the system. The production is limited by the values of the mixture flow velocity and concentration that the system is capable to establish in a pipeline. A co-operation between pumps and a pipeline of a dredging system is discussed in the second part of these lecture notes.



**The hydraulic transport test stand.**

