

## Chapter 6

### Topic 1. Commercial Pipe and Tubing Standards

#### \* Notes

- Real systems use standardized pipe types, not ideal geometries
- Common Types: steel, ductile iron, steel tubing, copper tubing, plastic pipe/tubing.
- Each material differs in:
  - internal roughness
  - strength & pressure rating
  - corrosion resistance
- Pipe "size" is standardized and does not directly equal inner diameter.
- Engineering design requires matching flow requirements to available commercial sizes.

#### \* Why wasn't this covered in class?

- Course is usually spent on fundamental fluid behavior & governing equations. Material selection & standardized sizing are design details that are typically introduced in later engineering design or system courses.

#### \* ~~Important~~ Topic & Useful!

- Yes. Any practical fluid system design depends on knowing what components are actually available & how their physical properties influence performance.

#### \* ~~Useful?~~ Important?

Yes Real world piping system cannot be designed using theoretical diameters. Engineers must select standardized component that effect performance & cost

## Topic 2: Torricelli's Theorem

### \* Notes:

- Derived from Bernoulli's equation for flow out of a tank
- Relates fluid height to exit velocity:
  - higher fluid levels  $\rightarrow$  higher exit velocity
- Used to estimate:
  - discharge rate from tanks
  - emptying time of reservoirs
- Assumes:
  - negligible viscosity losses
  - ideal flow conditions

• Common in drainage, fuel tanks, fluid storage system

### \* Why wasn't it covered in class?

- Courses focused on Bernoulli's equation in pipe system rather than open-surface tank discharge problems, which are more specific application

### \* Important?

Yes. It connects energy principles to real draining & filling systems, which are common in industrial storage and process engineering

### \* Useful to you?

Yes. Direct method for estimating how long tank empties. Important to safety design, scheduling, fluid handling systems

## Chapter 7

### Topic 1. Energy addition & removal in fluid systems

#### ★ Notes

- Fluid system can gain or lose energy because of equipment or condition.
- Energy can be added to fluid or removed
- Extend Bernoulli's equation beyond ideal flow
- Focus on identifying where energy enters or leaves
- ideas form basis for general energy equation

#### ★ Why wasn't it covered in class?

- Focus was on ideal Bernoulli flow & basic ~~flow~~ fluid behavior before system-level energy additions & removal

#### ★ important?

- Yes. connects ideal flow to real systems

#### ★ Useful topic?

- Yes. It helps identify where energy is added or removed in real systems

## Topic 2: Pressure head, Velocity head, Elevation head Interpretation

### \* Notes

- Bernoulli's equation expresses energy in terms of "heads"

- Three main forms

- Pressure head (energy from pressure)

- Velocity head (energy from motion)

- Elevation head (energy from position)

- These represent different ways energy is stored in a flowing fluid.

- Total head = sum of all three forms

- Used for comparing energy states at diff. points in a system.

### \* Why not covered in class?

- Focus was on solving Bernoulli problems rather than interpreting each term physically

### \* Important?

- Yes. It helps clarify what each term in Bernoulli's represents

### \* Useful?

- Yes. It helps interpret how fluid energy changes in systems

In a power plant or engine manufacturing environment, the material from these chapters provides a structured way to analyze how energy moves through fluid systems. The head-based form of the energy equation allows engineers to track how pressure, velocity, elevation change between components such as pipes, reservoirs, & machinery. This makes it possible to predict operating conditions & ensure that systems function within safe & efficient limits. Even before including losses or detailed equipment models, this framework supports basic design decisions such as selecting elevation, estimating pressure difference, & understanding how changes in system geometry influence performance.