

Norwegian University of Science and Technology

TPK4186

Advanced Tools for Performance Engineering

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## **Assignment 1- Pumping Circuits**

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March 08, 2020



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## Modules implemented

The different modules implemented in the code includes the following: -

### Core

The function of this module is to create the elements in the circuit. This module consists of the classes required to create different elements like tank, pump, pipe, bend, valve and filter in the circuit. Functions are also implemented to return the attributes of the different elements.

### TSVparser

The function of this module is to read the elements of the files in .tsv format and allocate it to the appropriate elements using the functions in the core module.

### XMLparser

Same as TSV parser but reads the .xml file

### SequenceChecker

This module checks the circuit for the different conditions that are to be followed in the circuit as given in the problem description.

### Calculator

This module performs the calculation that are needed to assess the energy consumption in the circuit. It also consists of functions to calculate the energy consumption when the different parameters are varied.

### HTML

This module helps to present the results in an html file including all the different graphs asked.

### Main

This is used to execute the program in the sequence needed.

## Points to note

- Appropriate line should be commented out in the main module according to the type of file. That is, line 19 for executing .tsv and line 20 for executing .xml files.
- The xml parser is case-sensitive
- Vertical pipes that go downwards are not included in the analysis. If it is to be done, it could be implemented by either reading in the angle as 270 degrees and then reducing the height using that as a condition.
- Though 8 rules are given to follow while designing some rules are split so that errors could be pointed out more precisely.
- If there is some design problem, the message is shown in the console and not in html file. The html file could still show the data the previous time a well-designed circuit was executed.
- Some inconsistencies may be present related to the structure of code, especially in the XML parser and the HTML, mainly because it was not built from scratch and is a modified version of the previously provided one.
- In the plot calculation the plotter could have been implemented as another function instead of repeating 5 times. This was tried in the end after implementing of everything including HTML and require lot of backtracking changes and hence was not implemented.
- Since no actual information regarding velocity was given and a limit on the Reynolds number is also given, a function to calculate the maximum velocity allowed is implemented in the calculator module and one of these values is used to calculate the actual energy in normal calculations.
- The velocity ranges used is given along with the graphs in the html file.
- The graphs for filter and valve are almost similar since the losses due to these are small compared to the other losses.
- CircuitTemplate is the template file, actual html file will be named circuit in the folder

## Path of the script

The classes are initialised in the main module after importing all the required modules. First it reads the files using one of the parser modules and later checks it for the design-rules. If it fails, an error message is displayed in the console. If it passes it then goes into the “if” statement where it executes the function to create the html file and then prints a summary of the experiment and the elements, the behaviour of energy consumption with different parameters. Inside the function it first goes into the calculator module to assess the energy consumption of the circuit with the given elements and attributes. Then it assesses the variation in energy consumption with efficiency, diameter, height, valve state and filter condition. Some lines are commented out in the main module as they were used in testing of the code and could be again used to see if individual sections are working as intended.

## Conclusion

All the functionalities that were asked is believed to be implemented in the script. The script was tested extensively for the well-designed phase. For the graphs the circuit given in the question was predominantly used to assess the behaviour and is also provided in the zip file in the name “test.tsv”. Some other circuit created for the purpose are also provided.