**INNOVATION LAB PROJECT REPORT**

**ON**

**Model Calculations Solver**

*A project report submitted in partial fulfilment of the requirement for the award of the degree of*

**BACHELOR OF TECHNOLOGY**

in

**CHEMICAL ENGINEERING**

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**Certificate**

Certified that this is a bonafide record of project work entitled “Model Calculations Solver” being submitted by “ASL Gannesh (19CH10036)”, in partial fulfillment for the award of the degree of “Bachelor Of Technology” in CHEMICAL ENGINEERING, Indian Institute of Petroleum and Energy, Vishakhapatnam during the academic year 2019-2023.

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**1. INTRODUCTION**

We discovered that performing model calculations for at least 5 different readings is time-consuming and inefficient because, after your initial model calculation, you have to repeat the same steps once more. This observation was made while conducting experiments on heat transfer and particle technology in our fifth semester of chemical engineering. Furthermore, it was challenging for us to find a reliable source from which we could compare our results and determine whether they were accurate or not. Therefore, we developed this website so that users may quickly and simply solve all calculations. We did this for certain experiments that were on our syllabus (the names of the experiments are provided below).

**Heat Transfer Experiments:**

1. Emissivity Measurement Apparatus
2. Counter Flow Double Pipe Heat Exchanger
3. Heat Flow Through Composite Wall

**Particulate Technology Experiments:**

1. Sampling
2. Time of Grinding
3. Effectiveness of Trommel

**2. MOTIVATION**

One of our seniors made a website on model computations for laboratory experiments. This concept of developing a website inspired us. Even if MS Excel is available to us, there are some drawbacks to its student usage. Our website was created primarily to meet the needs of lab experiments for students. Free access, a simple design, usability, and accurate results are a few benefits.

**3. PROBLEM STATEMENT**

The main motto of this project is to save time and increase efficiency of results while performing lab calculations.

**3. DESIGN AND FABRICATION OF PROTOTYPE**

**Web Technologies**: To structure and design a layout, we utilised HTML and CSS. For computations and to make the webpage interactive, we used JavaScript. Graphs are generated by utilizing CanvasJS API.

**Software used**: We used Visual Studio Code to write the code. And Git for tracking code changes.

**Code hosting**: To share code and host the project online, we utilised github.

**Client-Side Code:** For all lab experiments, we have coded all the formulas and calculations using JavaScript.

**Implementation**: We have deployed the wesbite on github pages and tested it on various devices – (Mobile, Tab, PC) and browsers (Chrome, Firebox and Mozilla).

**Trail**: Using the values from our observation notebook, we tested our website for all of our lab experiments.

**4. WORKING OF PROTOTYPE**

We have developed the webpage as per requirements of this project. We have also implemented, executed and tested the webpage on various experimental values and found that the results are accurate enough.

**TESTING**

**Test objectives**

* All field entries must work properly.
* Pages must be activated from the identified link.
* The entry screen, messages and responses must not be delayed.

**Features to be tested**

* Verify that the entries are of the valid format.
* Invalid entries should not be allowed.
* All links should take the user to the correct page.

**Test Results**: All the test cases mentioned above passed successfully. No defects encountered.

**5. TECHNOLOGIES AND SOFTWARE USED**

* HTML, CSS, Bootstrap and JavaScript
* Visual Studio Code, Git & Github

**6. SOFTWARE SPECIFICATION**

1. **HTML (HYPER TEXT MARKUP LANGUAGE)**:

It is a standard markup language used to build web pages. HTML is written in HTML elements, which are simply tags contained in angle brackets, like <html>. HTML tags usually include pairs like "<h1>" and "</h1>" although some tags, like "<img>" represent empty elements and are therefore not paired. The beginning tag is the first tag in a pair, while the final tag is the end tag (they are also called opening tags and closing tags). It is recommended practise to add a slash to tags that are not linked with a closing tag, while it is not always necessary.

A web browser's job is to read HTML files and merge them into visible or audible appealing web pages. Although the HTML tags are not displayed by the browser, they are used to interpret the page's content. HTML is a markup language rather than a programming language since it provides presentation cues along with semantic descriptions of the structure of a website.

All webpages are constructed using HTML elements. HTML enables the embedding of objects and images, and it can be used to develop interactive forms. By indicating structural semantics for text elements including headers, paragraphs, lists, links, quotes, and other objects, it offers a way to produce structured documents. It has the ability to embed scripts that modify the behaviour of HTML web pages and are written in languages like JavaScript.

1. **CSS (CASCADING STYLE SHEETS):**

It is style sheet language that is used to describe the appearance and formatting of a document written in a markup language. The language can be used to style any type of XML document, including plain XML, SVG, and XUL. However, it is most frequently used to style web pages and interfaces written in HTML and XHTML. Most web pages utilise CSS style sheets to describe how they are presented since CSS is a key web specification.

The main purpose of CSS is to make it possible to separate a document's content from its presentation, which includes things like the layout, colours, and fonts. This division can increase the accessibility of the content, give the specification of presentation features greater flexibility and control, allow multiple pages to share formatting, and minimize the complexity and duplication of the structural content.

The same HTML page can also be rendered using several rendering techniques using CSS, including on-screen, in print, by voice (when read aloud by a screen reader or speech-based browser), and on Braille-based tactile devices. Additionally, depending on the screen size or viewing device, it can be used to enable the web page to appear differently. Readers can override the style sheet that the author has specified by using a different style sheet, possibly one that is on their own computer, even if the author normally links a document to a CSS file. However, the default style of the browser will be used if the author or reader did not link the document to a specific style sheet.

1. **JAVASCRIPT:**

The Web's primary programming language is JavaScript. JavaScript is used on every modern HTML page. A scripting language is a light-weight programming language.  JavaScript code can be inserted into any HTML page, and it can be executed by all types of web browsers. JavaScript is simple to learn.

**Why to use JavaScript**

JavaScript is one of the 3 languages all web developers  must learn:

1. HTML to define the content of web pages
2. CSS to specify the layout of web pages
3. JavaScript to specify the behavior of web pages

**Example**

x = document.getElementById("result");  //Find the HTML element with id="result"  
x.innerHTML = "This is JavaScript";     //Change the content of the HTML element

document.getElementById() is one of the most commonly used HTML DOM methods.

**Other uses of JavaScript**

* Delete HTML elements
* Create new HTML elements
* Copy HTML elements
* In HTML, JavaScript is a sequence of statements that can be executed by the web browser.

**JavaScript Statements**

* JavaScript statements are "commands" to the browser.
* The purpose of the statements is to tell the browser what to do.
* This JavaScript statement tells the browser to write "Hello Dolly" inside an HTML element with id="demo":

**Semicolon;**

* Semicolon separates JavaScript statements.
* Normally you add a semicolon at the end of each executable statement.
* Using semicolons also makes it possible to write many statements on one line.

**JavaScript Code**

* JavaScript code is a sequence of JavaScript statements.
* Each statement is executed by the browser in the sequence they are written.
* This example will manipulate two HTML elements:

**Example:**

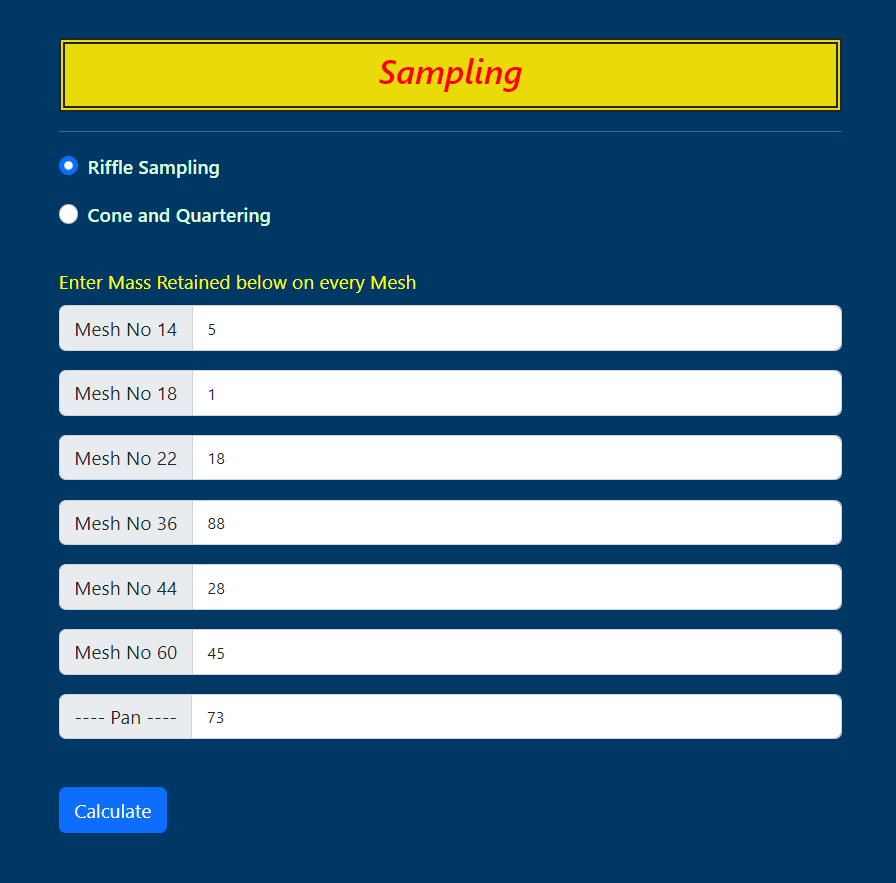
document.getElementById("demo").innerHTML="Here is the demo text";  
document.getElementById("result").innerHTML="The ans is";

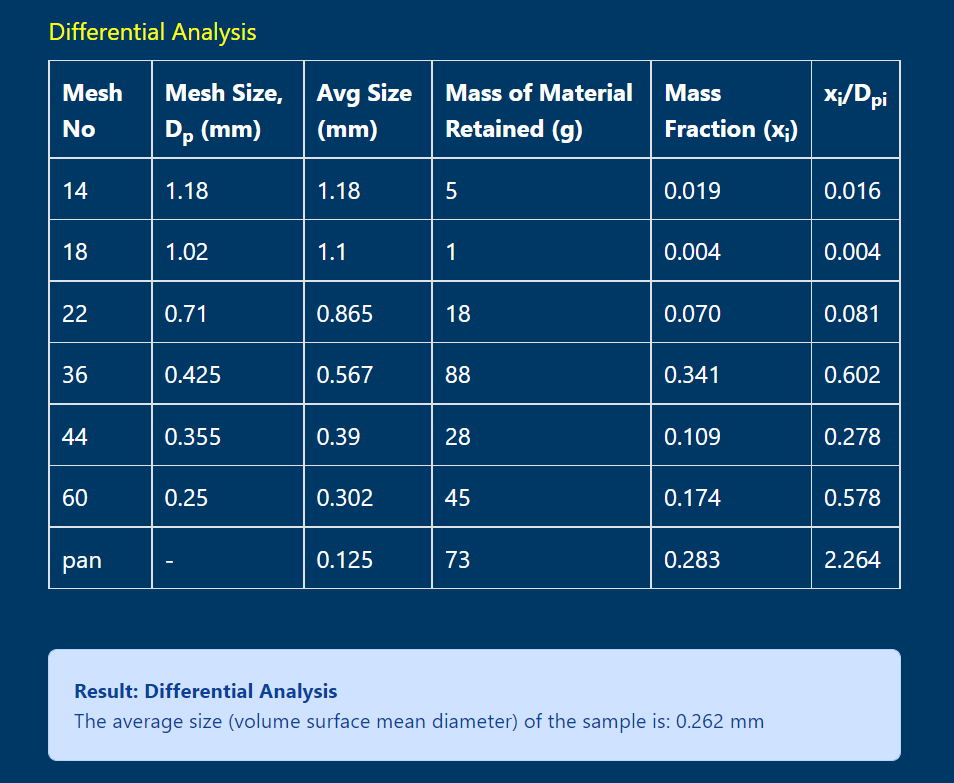
**JavaScript Properties:**

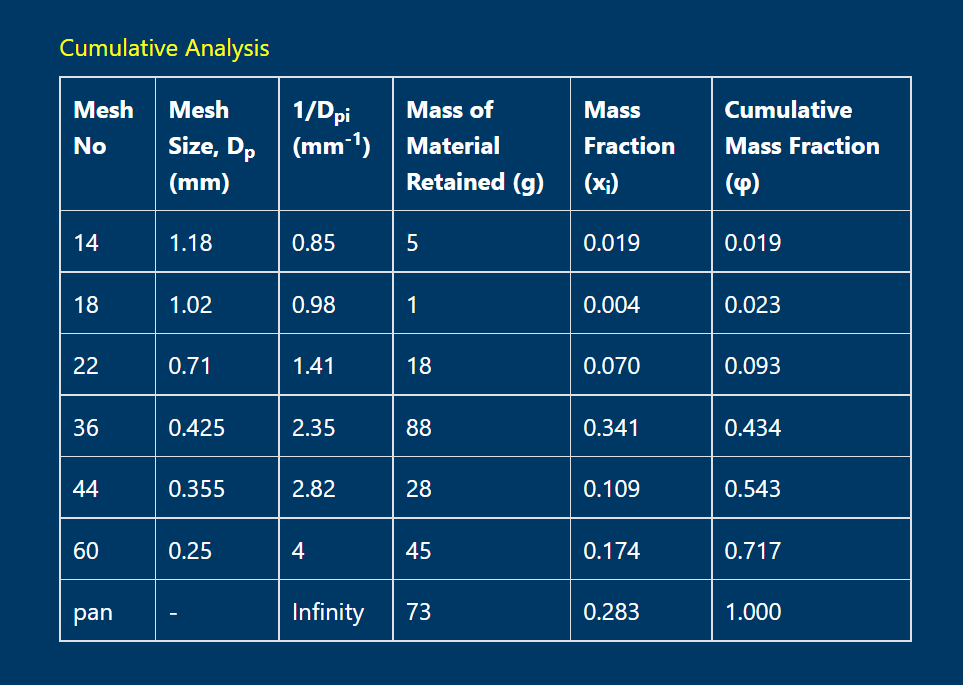
* Properties are the values associated with a JavaScript object.
* A JavaScript object is a collection of unordered properties.
* Properties can usually be changed, added, and deleted, but some are read only.

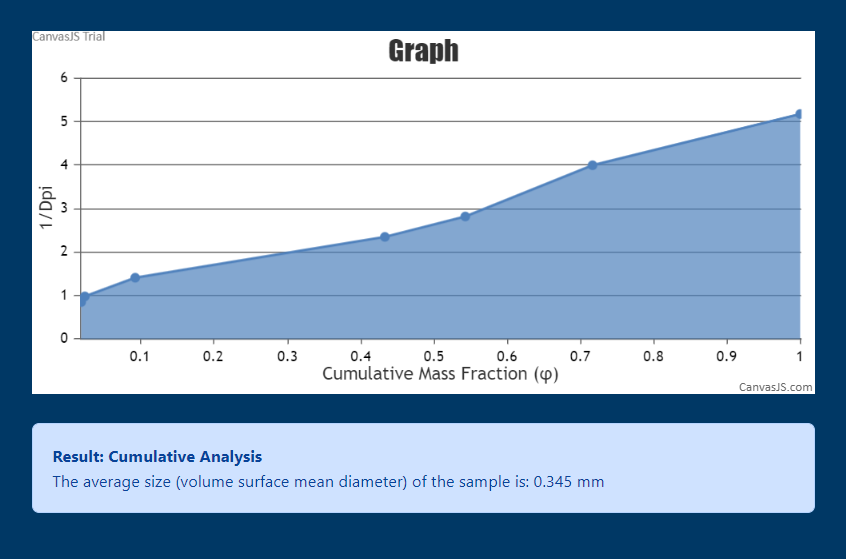
**7. SAMPLE SCREENSHOTS**

*Sampling*

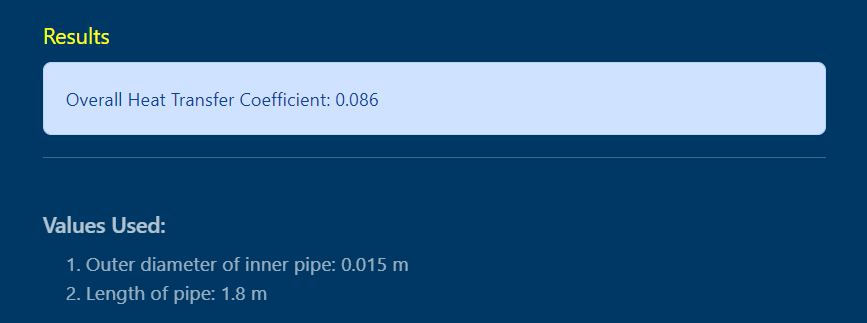
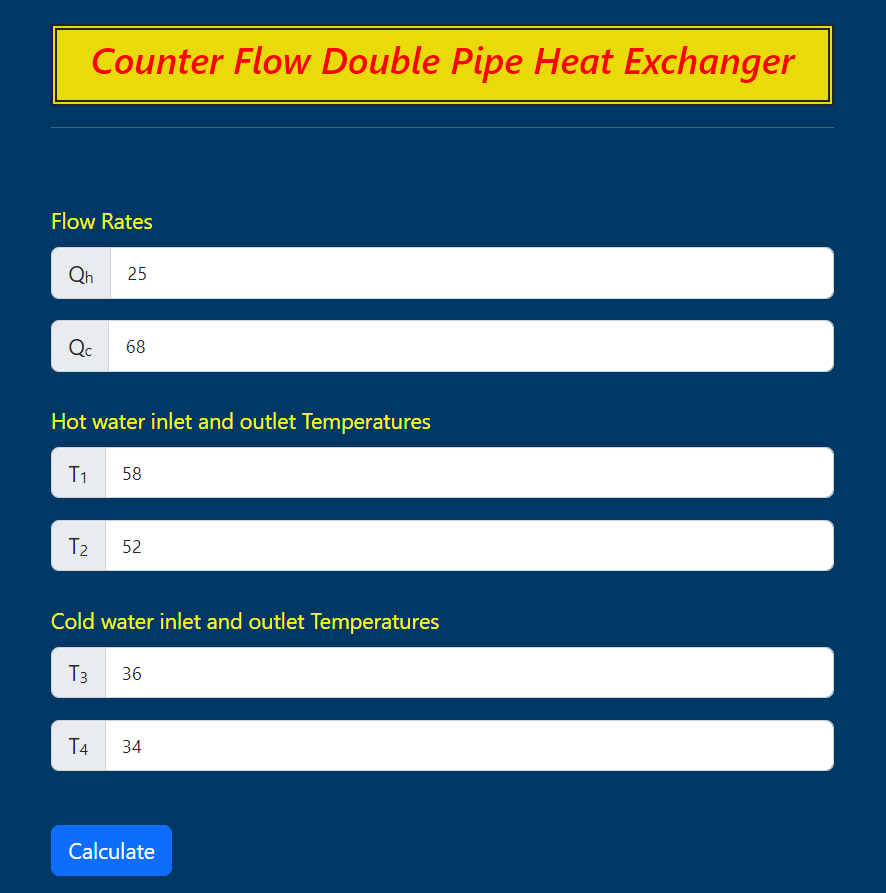








*Counter flow Double Pipe Heat Exchanger*



**8. CONCLUSION AND FUTURE ASPECTS**

We are happy to say that our website is working as efficient as we anticipated and generating accurate results for every experiment immediately after entering observation values.

Our senior had initiated the idea of creating a webpage of model calculations with fluid lab experiments. Now we extended this idea by developing the website for Heat Transfer and Particle Technology lab experiments. This website can be further extended for Instrumentation and Process control, Mass transfer, Chemical Reaction Engineering lab experiments.

**9. REFERENCES**

1. <https://github.com/rohit-bindal/FluidLab>/
2. <https://getbootstrap.com/>
3. <https://canvasjs.com/>
4. <https://stackoverflow.com/>­­­