

FORCES ON PLATES LABORATORY

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LAB #2

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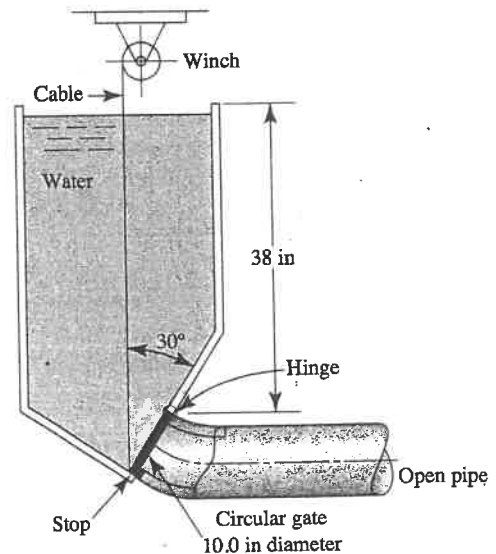
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OBJECTIVE:

To determine the forces of static fluid on plates using the Matlab engineering software.

BACKGROUND:

Using the Matlab engineering software, the following problem is to be solved. The following figure shows a tank filled with fluid X with a circular pipe connected to its bottom. A circular gate seals the pipe opening to prohibit flow. To drain the tank, a winch is used to pull the gate open. For each situation compute the amount of force that the winch cable must exert to open the gate.



CASES:

Case #1:

Fluid Type: Water

Circular gate diameter is 10 inches.

Angle of inclination varies from 20° to 45° in increments of 5°.

Plot the resultant force F_R of the fluid versus the angle of inclination.

Plot y_R versus the angle of inclination.

Plot x_R versus the angle of inclination.

Case #2:

Fluid Type: Machine Oil with S.G.=0.915

Circular gate diameter varies from 8 inches to 20 inches in increments of 2 inches.

Angle of inclination stays constant at 30° .

Plot the resultant force F_R of the fluid versus gate diameter

Plot y_R versus the gate diameter

Plot x_R versus the gate diameter

Case #3:

Fluid Type: Liquids listed in Table B.1

Circular gate diameter is 10 inches.

Angle of inclination is 30° .

Plot the resultant force F_R of the fluid versus the S.G. of the liquids.

Plot y_R versus the S.G. of the liquids.

Plot x_R versus the S.G. of the liquids.

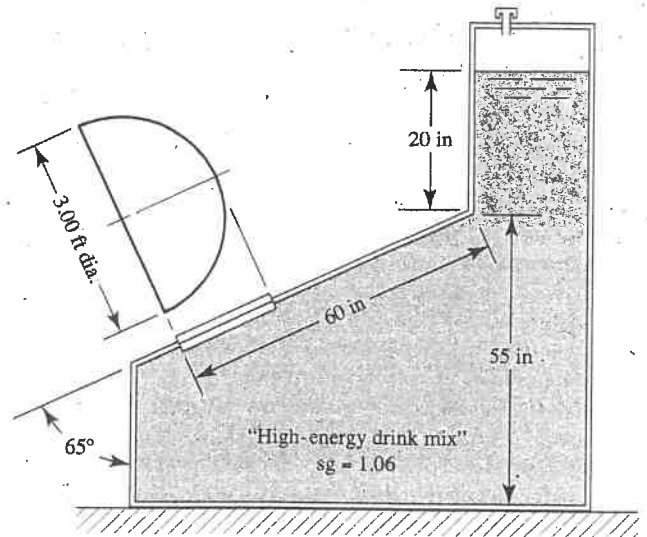
Which of the liquids has the largest F_R value and which one has the smallest?

Turn in: plots, a sample calculation for each case, and a brief two page report of the findings. Please use a cover sheet. Under what conditions would it the winch cable need to exert the most force to open the gate? Under which conditions will it exert the smallest force?

Problem #2

For the following figure determine, the resultant force (F_R) caused by the fluid on the plate and the center of pressure for this force, (L_p), defined as the inclined distance from the surface to where the force F_R acts when plate is inclined as

- a) shown in the figure
- a) flipped over 90°
- b) flipped over 180° .



Determine which position is the better one for this plate?

A formal report needs to be written for this laboratory and the above questions need to be answered are answered for each case.