Contents


```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 13300 Fall 2021
%
% Problem Description: tells the saftest max volume for a tank given the inputs
% of the length and diameter, saftest volume percentage, and fluid
% increment
%
%
%
% Assignment Information
%   Assignment:     Ind HW6 - MA2
%   Author:         Maximilian Drach, mdrach@purdue.edu

%   Team ID:        LC5 - 07
%
%   Contributor:    Name, login@purdue [repeat for each]
%   My contributor(s) helped me:
%     [ ] understand the assignment expectations without
%         telling me how they will approach it.
%     [ ] understand different ways to think about a solution
%         without helping me plan my solution.
%     [ ] think through the meaning of a specific error or
%         bug present in my code without looking at my code.
%   Note that if you helped somebody else with their code, you
%   have to list that person as a contributor here as well.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

INITIALIZATION

```
tank_length = 20.5; %meters
tank_diameter = 4.1; %meters

%fluid heigth increment
fhi = .25; %meters
safe_capacity = .8; %80 precent
```

CALCULATIONS

```
tank_radius = tank_diameter/2; %meters


%cylinder_center_length
ccl = tank_length-tank_diameter; %meters

%gets the area of the cylinder part
max_cylinder = (tank_radius^2)*ccl*pi;
%2 semi-spheres equal a full sphere, so i just used the sphere volume
%formula
max_sphere = (4/3)*pi*(tank_radius^3);
%got the theoreitcal max volume
theoretical_max_vol = max_sphere + max_cylinder;%meters^3

%got the actual safe volume using the saftey capacity percentage
max_safe = safe_capacity*(theoretical_max_vol);%meters^3

%created the height vector
h = 0:.25:tank_diameter;

%set the fluid volume and volume tolerance to 0
fluid_volume = zeros(floor(tank_diameter/fhi));
vol_tol = 0;

%started the index counter
n=0;

while fluid_volume < max_safe-vol_tol
    %increment counter
    n = n+1;
    %gets the fluid volume from the heigth vector
    term1 = (pi*(h(n))^2)*((3*tank_radius)-h(n))/3;
    term2 = (tank_radius^2)*(acos((tank_radius-h(n))/tank_radius));
    term3 = (tank_radius-h(n))*sqrt((2*tank_radius*h(n)) - (h(n)^2));
    fluid_volume(n) = term1 + ccl*(term2-term3);

    %replace the hight with the radius+(.5*the fluid height increment)
    h(n) = tank_radius+(.5*fhi);
    %re-does the fluid volume for the volume tolerenace
    term1 = (pi*(h(n))^2)*((3*tank_radius)-h(n))/3;
    term2 = (tank_radius^2)*(acos((tank_radius-h(n))/tank_radius));
    term3 = (tank_radius-h(n))*sqrt((2*tank_radius*h(n)) - (h(n)^2));
    tol_term1 = term1 + ccl*(term2-term3);

    %replace the hight with the radius-(.5*the fluid height increment)
    h(n) = tank_radius-(.5*fhi);
    %re-does the fluid volume for the volume tolerenace
    term1 = (pi*(h(n))^2)*((3*tank_radius)-h(n))/3;
    term2 = (tank_radius^2)*(acos((tank_radius-h(n))/tank_radius));
    term3 = (tank_radius-h(n))*sqrt((2*tank_radius*h(n)) - (h(n)^2));
    tol_term2 = term1 + ccl*(term2-term3);

    %gets the volume tolerance by subtracting term1 form term2
    vol_tol = tol_term1-tol_term2;
end
```

OUTPUTS

```
fprintf('The number of iterations is %d\n', n);
fprintf('The safe fill volume is %f\n', max_safe);
fprintf('The final fluid volume is %f\n', fluid_volume(n));
```

```
The number of iterations is 13
The safe fill volume is 202.086927
The final fluid volume is 199.460599
```

ACADEMIC INTEGRITY STATEMENT

I have not used source code obtained from any other unauthorized source, either modified or unmodified. Neither have I provided access to my code to another. The project I am submitting is my own original work.

Published with MATLAB® R2021b