



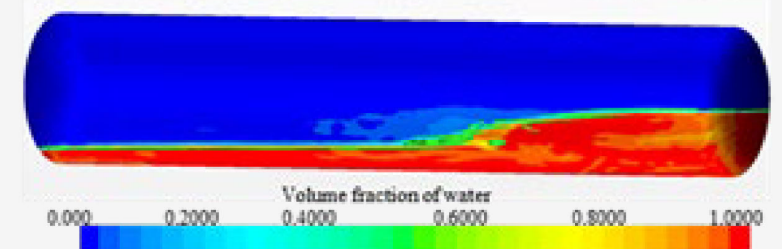
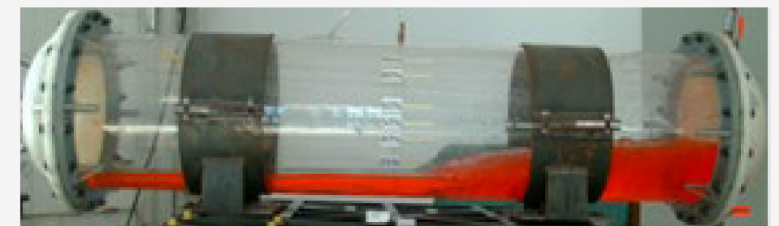
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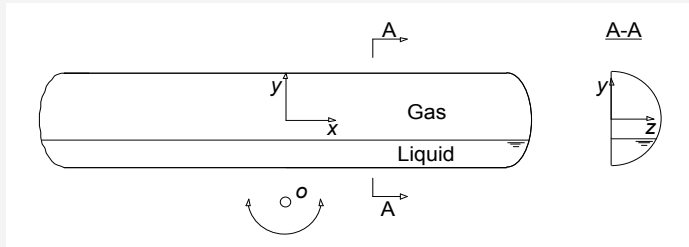
# Numerical research on the anti-sloshing effect of a ring baffle in an independent type C LNG tank

## Key words:

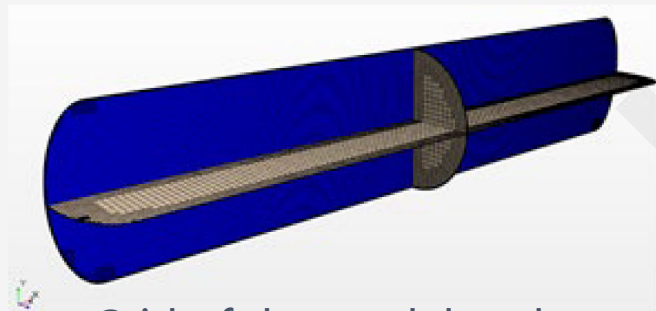
Sloshing; Ring baffle; Independent type C LNG tank; Parameter sensitivity



# The Main Method and Device



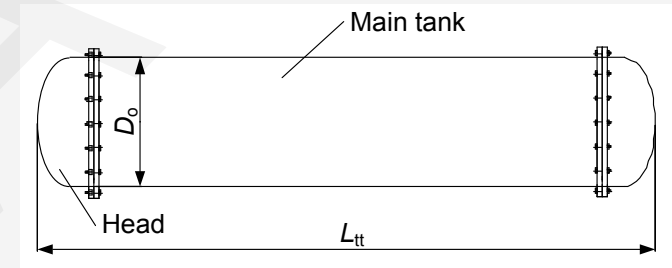
Model for numerical computation



Grid of the model tank



Verifacation

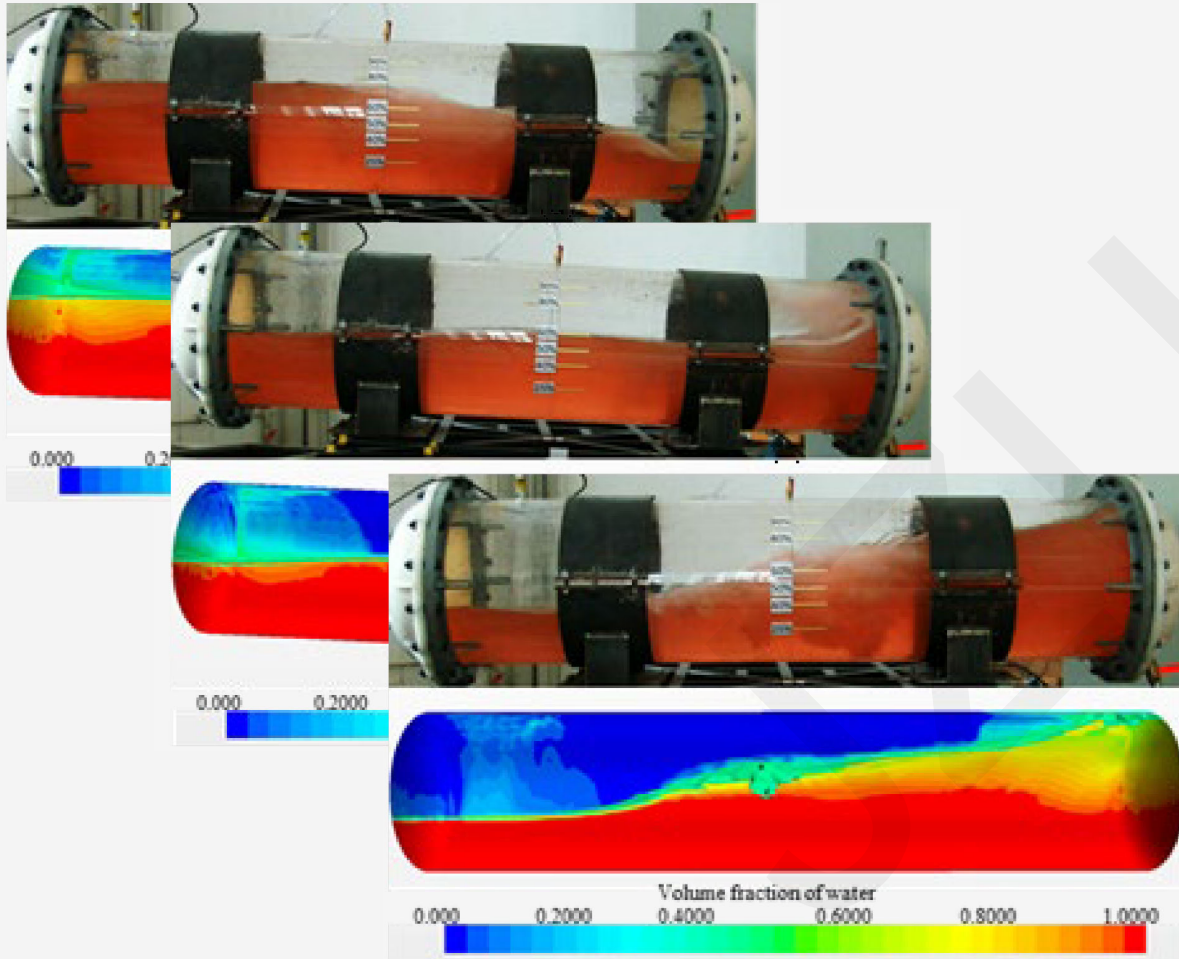


Test model tank

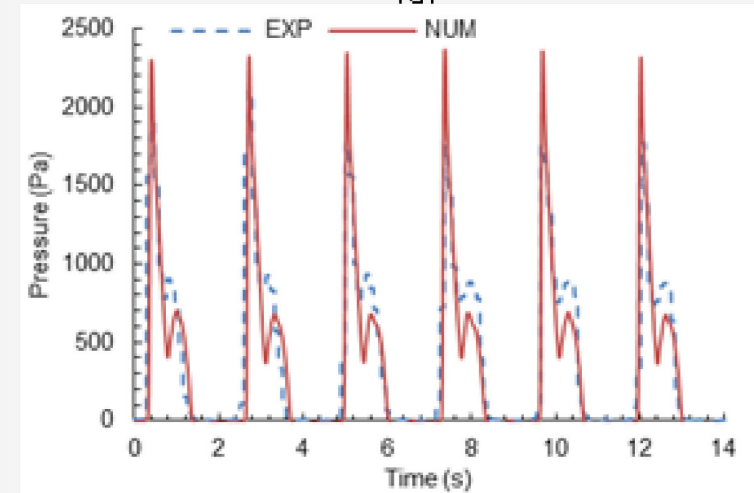
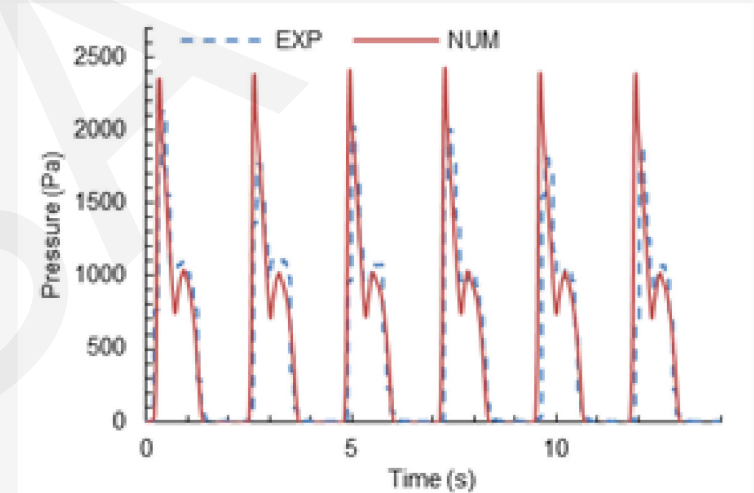


Experimental devices

# Excperimental Validation



Qualitative validation



Quantitative validation

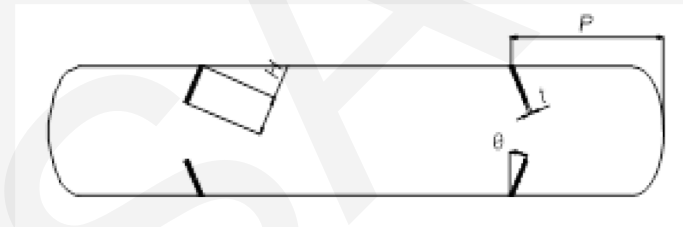
# Analysis of Simulation

# on Parameters of ring baffle

Orthogonal Analysis of Simulation

| Source          | Type III sum of squares | df | Mean square | F        | Significance |
|-----------------|-------------------------|----|-------------|----------|--------------|
| Corrected model | 2.883                   | 10 | 0.288       | 50.592   | 0.000        |
| Intercept       | 41.227                  | 1  | 41.227      | 7234.420 | 0.000        |
| <i>H</i>        | 2.054                   | 2  | 1.027       | 180.184  | 0.000        |
| $\theta$        | 0.316                   | 4  | 0.079       | 13.868   | 0.000        |
| <i>t</i>        | 0.017                   | 2  | 0.008       | 1.474    | 0.262        |
| <i>P</i>        | 0.497                   | 2  | 0.248       | 43.567   | 0.000        |
| Error           | 0.080                   | 14 | 0.006       |          |              |
| Total           | 57.382                  | 25 |             |          |              |
| Corrected total | 2.963                   | 24 |             |          |              |

1  
3  
4  
2

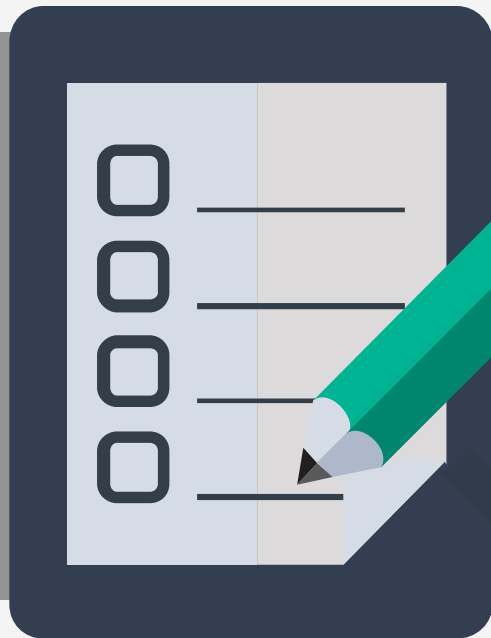


Parameters of ring baffle

| 平均值 | 因素       |          |          |          |
|-----|----------|----------|----------|----------|
|     | <i>H</i> | $\theta$ | <i>t</i> | <i>P</i> |
| K1  | 1.1336   | 1.6574   | 1.4862   | 1.6100   |
| K2  | 1.6435   | 1.4743   | 1.4904   | 1.4662   |
| K3  | 1.8226   | 1.5282   | 1.4237   | 1.2246   |
| K4  | -        | 1.3570   | -        | -        |
| K5  | -        | 1.3601   | -        | -        |
| R   | 0.6890   | 0.3004   | 0.0667   | 0.3854   |

1                      3                      4                      2

# Conclusions



The height, the installed position, and the installed angle can have great influence on suppressing sloshing. The thickness of the baffle has little effect.

The height of the ring baffle is proportional to its efficiency in anti-sloshing through analysis of orthogonal simulation experiments. However, the room for improvement in suppressing sloshing decreases after the height of the baffle exceeds  $0.20D_t$ .

A vertical ring baffle is more effective than an inclined baffle in restraining the velocity of the fluid as it provides a greater blockage effect. There is also a difference for different directions of the incline of the baffle. When the ring baffle is inclined, it is more effective in reducing sloshing when the top of ring baffle rotates away from the head of the tank. However, this difference of sloshing reduction decreases as the inclined angle is increased.

The efficiency of anti-sloshing declines when the ring baffle is set close to the ends of tank, as there is an increased length of free surface and elevation difference of the free surface in the middle of tank.

According to the analysis results obtained for an independent type C LNG tank with a longitudinal excitation, a ring baffle performs well in suppressing sloshing when suitably designed in height, position, and inclined angle.