

Minimize placard's drag force

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Project statement

❖ Problem of placard

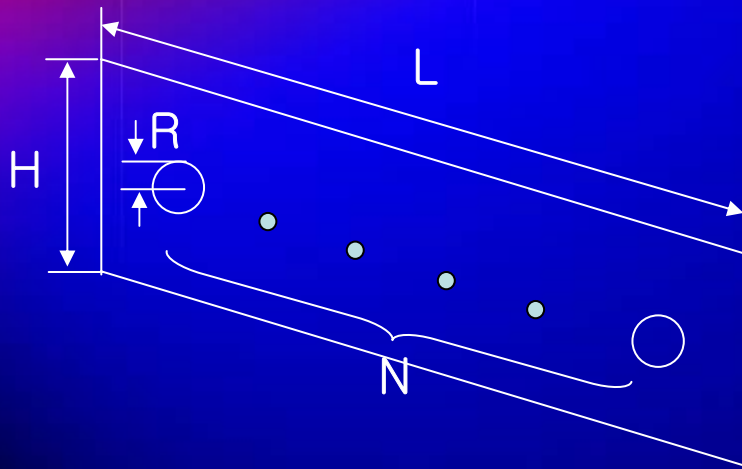
- ✓. Tare in Placard
- ✓. Wire snapped
- ✓. Column broken



*Minimize
Drag force*



Information collection and Identification of variable



❖ Data for project

	Data
$L(m)$	8
$H(m)$	0.6
$V(m/s)$	2.41

❖ Design variables

x_1 : Number of hole (N)

x_2 : Radius (R)

Identification of a objective function

❖ Make a Objective Function

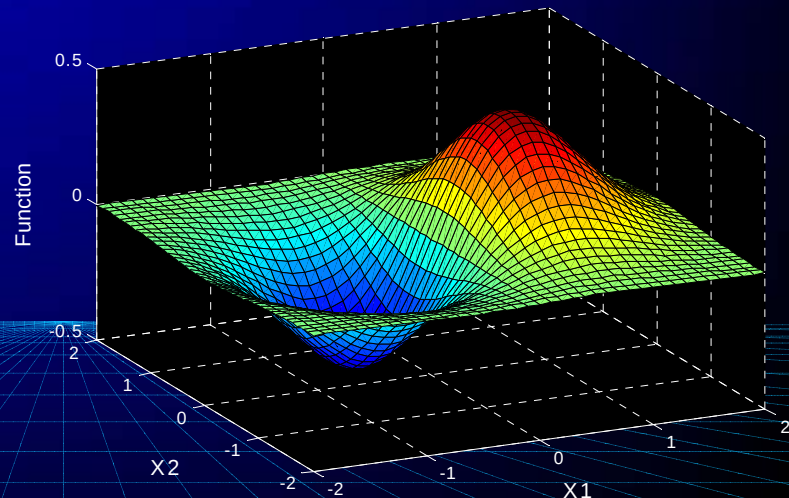
Calculate Drag force using Simulation

Create Drag force Function by Curve Fitting

❖ Minimize $f(x_1, x_2)$

Graphical method

Numerical method



Identification of constraints

- ❖ Area of Holes less than 5% placard's Area

$$\text{Constraint. 1} \quad A_h \leq 0.05 \times A_p$$

$$A_h = x_1 \times \pi x_2^2, \quad A_p = L \times H$$

- ❖ Length of between holes more than 1.5 times radius

$$\text{Constraint. 2} \quad 2x_2(5x_1 + 3) \leq L$$

$$x_1 \times 2x_2 + (x_1 + 1) \times 3x_2 \leq L$$

$$\text{Constraint. 3} \quad 0 \leq x_1(\text{int}) \leq 30, \quad 0 \leq x_2 \leq 0.1$$

Future work

- ❖ Certification CFD result
- ❖ Geometry generate and simulation
- ❖ Make a objective function
- ❖ Find optimum solution