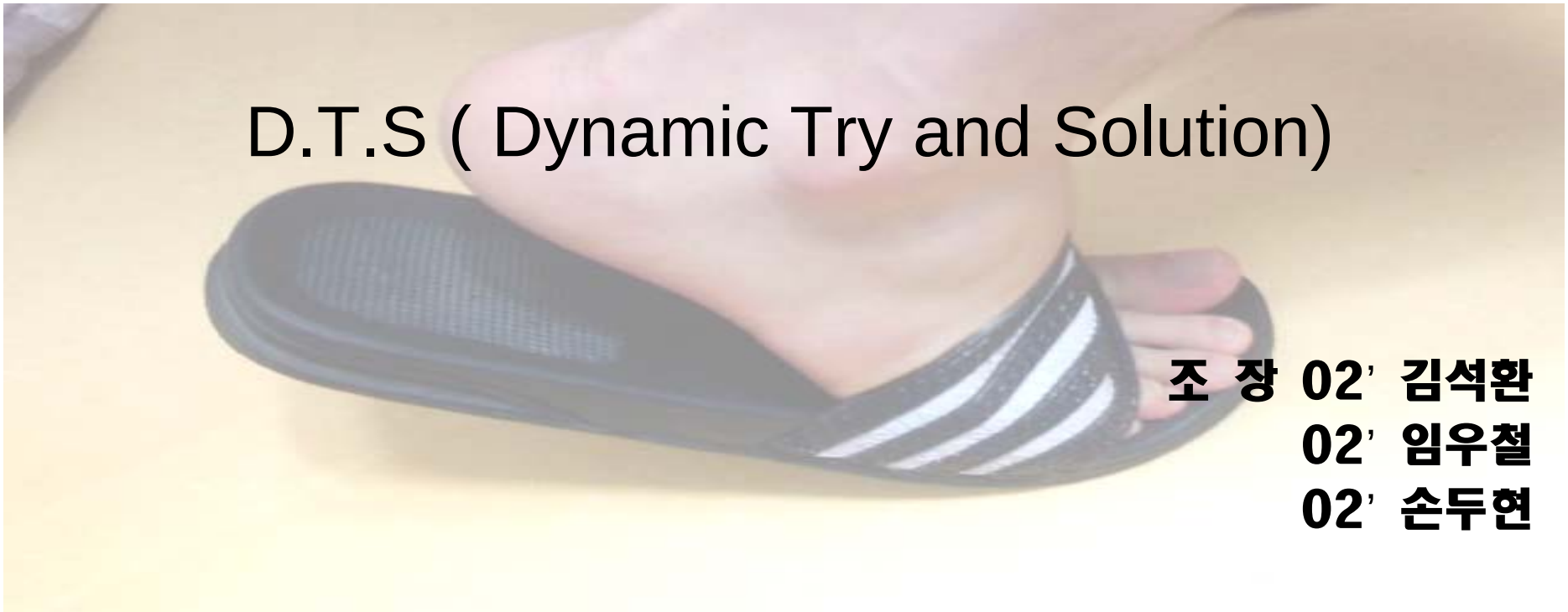
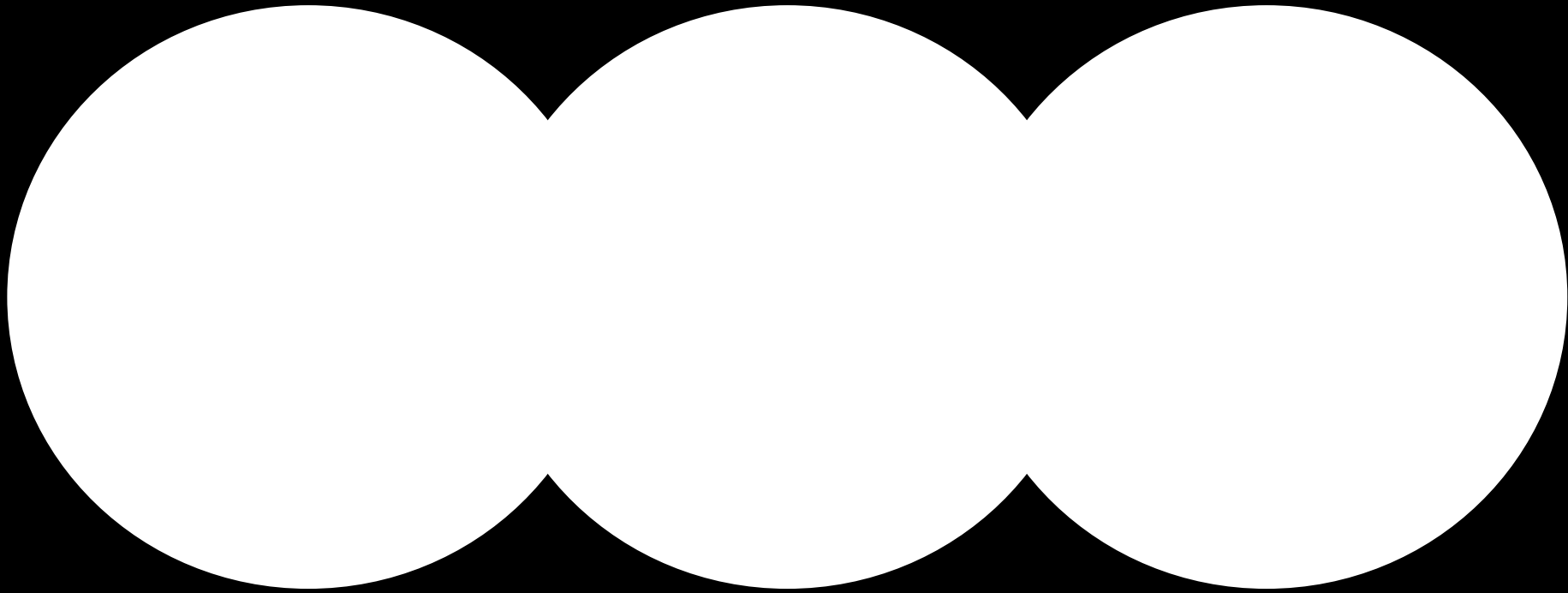
삼선슬리퍼를
오래 신고 싶으쎘셔여?



D.T.S (Dynamic Try and Solution)

조 장 02' 김석환
02' 임우철
02' 손두현

팀원소개



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- Step 5. Constraints

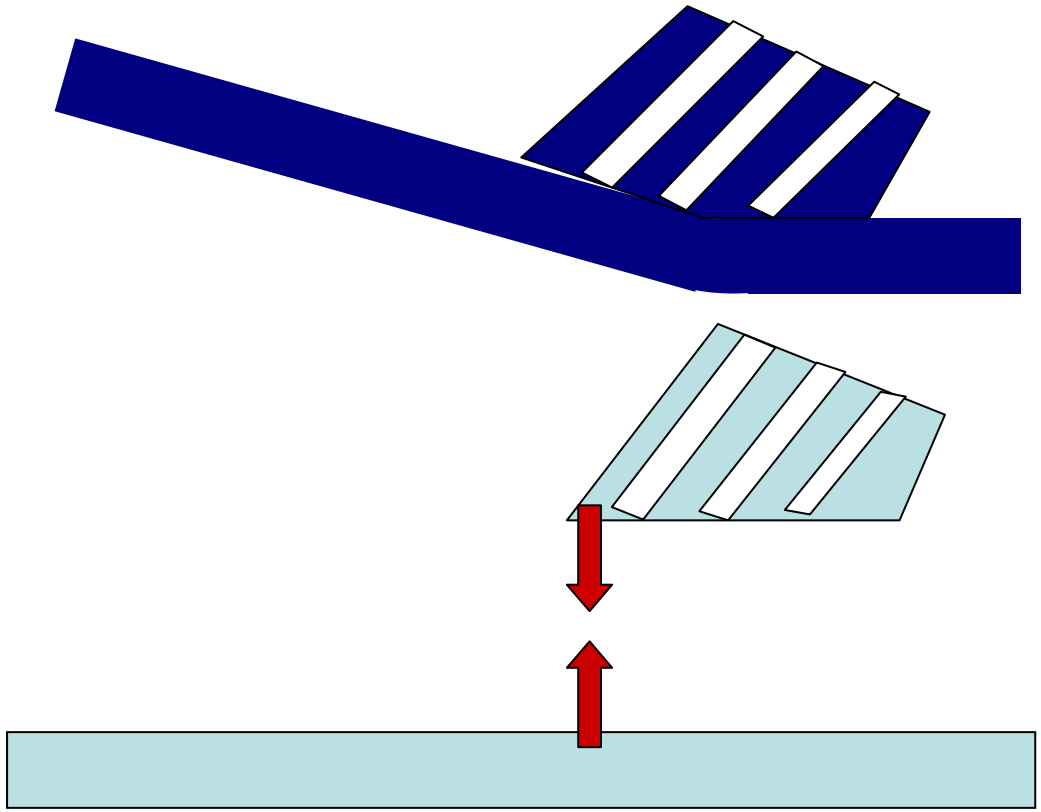
Step 1. Problem statements

a. Design a minimum mass three-lined flip-flop endure a given load without material failure and while satis-fying performance requirement.

b. Cost directly related to the thickness of the bottom and the cover.

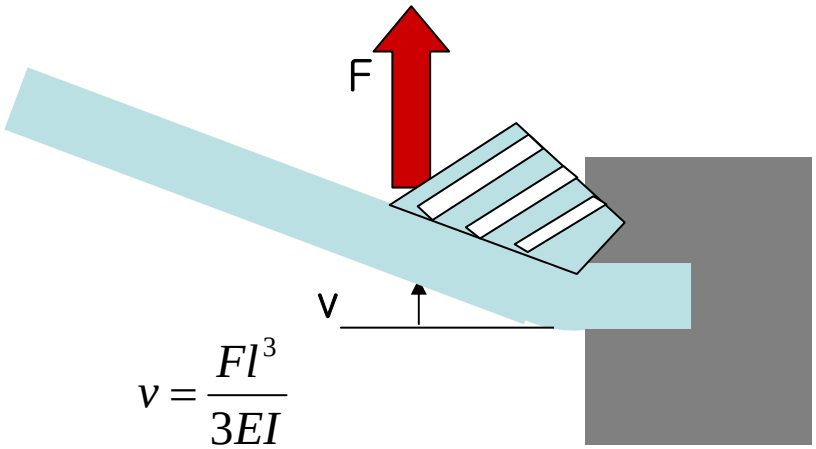
Step 2. Data and information collection

Modeling

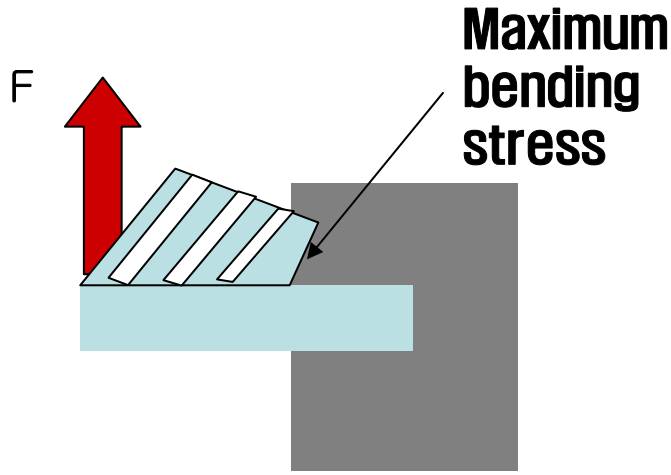


Step 2. Data and information collection

Modeling &
Analysis



처짐량으로부터 F 를 구함



F로부터 bending stress 를 구함

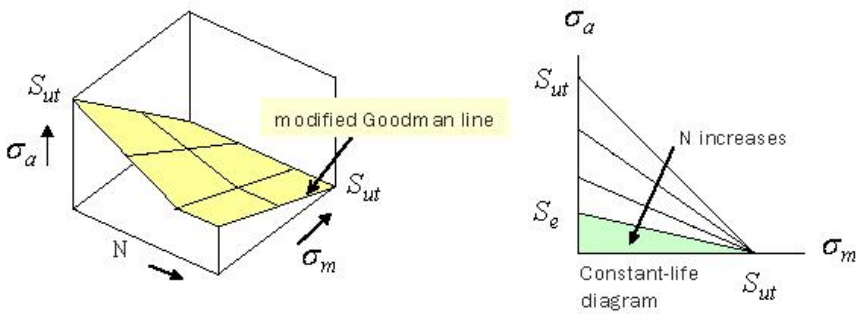
Step 2. Data and information collection

Assume the shear stress is negligible because bending stress is dominated.

Moment of inertia $I = \frac{wt_1^3}{12}$

$$F = \frac{3EI}{d^2}\frac{h}{l} \qquad \sigma_1 = \frac{9Eih}{wt_1^{\ 2}ld} \qquad \sigma_2 = \frac{21Eih}{2t_2 d^3 l}$$

Fatigue failure



life cycle = 5000(n/day) * 365(days) * 6 (year)

≒ 10000000 cycle = 10^7 cycle

$$S'_{f\,@10\wedge7} \geq S_{f\,@5E+8}$$

There are **mean** and **alternating** stress.

=> Following Modified Goodman line.

Let safety factor =1 (worst case)

$$N_f \le \frac{S_f S_{ut}}{\sigma_a S_{ut} + \sigma_m S_f}$$

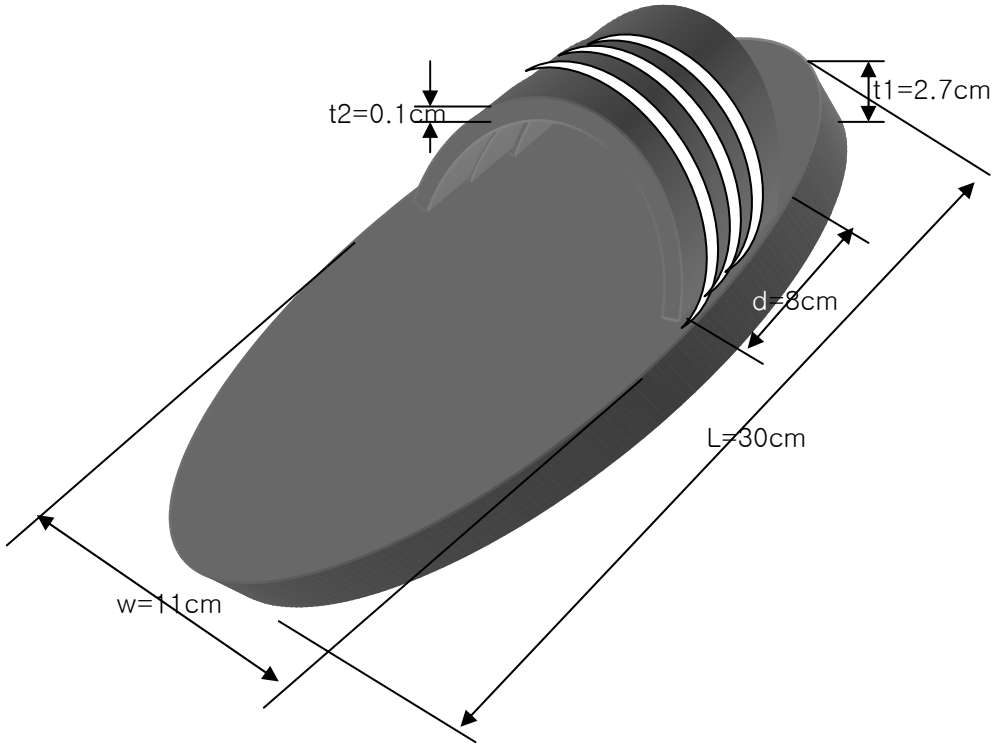
⇒ σ와의 관계, 이로부터 t1과 t2와의 관계를 유도 ⇒ Constraint

Material property (PVC – p1000 ※ref.한화석유화학)

- Mass density : ρ = 1380kg/m³
- Young's modulus : E = 2.9 ~ 3.3 GPa
- Allowable stress : σa = 50 ~ 80 MPa

Step 2. Data and information collection

Schematic



Step 3. Design variables

Thickness of bottom : t_1
Thickness of cover : t_2

Step 4. Cost function

$$Mass = f(t_1, t_2) = \rho V = \rho(Lwt_1 + \pi wdt_2)$$

Step 5. Constraints

$$g_1 = 1 - \frac{4ld}{3Et_1 h}\left(\frac{S_{ut}S_f}{S_{ut}+S_f}\right) \le 0$$

$$g_2 = 1 - \frac{16t_2 d^3 l}{7Ewt_1^3 h}\left(\frac{S_{ut}S_f}{S_{ut}+S_f}\right) \le 0$$

감 사 합 니 다