### TEIL1: Niautuneare Optimierung

## purposed washing a found whe recent mailte dual & (8) Argabe 1: optimale Dimensioniering eines hühlhreislaufe in einem Ken wast werk

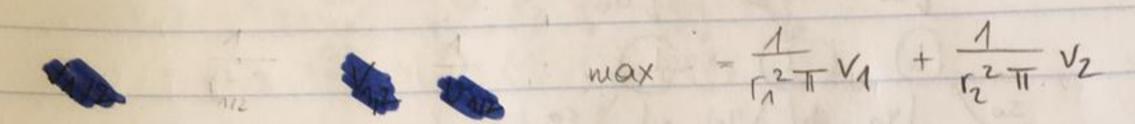
2 houlflossique -> untschil Vishositat 2 getreunter Kreislaufen unel proportional to aversaling. v. Vishositat

15° C SELION SELION

(St. Fligg. 100, (B) 1 miles best

1 /12 > optimal

211 +212 330 cm 2 m + 2 m = 60 cm



win 12 TT V1 + 122 TT. V2

-211 -212+3060 = 91 (11/2) NB: 21/ +21/2 7/30 211+212-60 = 92 (11,52) 211 + 212 = 60 4,12 70

Lagrange Function

L(9,52,1/1,12)= V1;512+12.52+11(-251-252+30)+ 12. (211+212-60)

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Regulantatsbedingung

$$\frac{\partial g_1(r_1, r_2)}{\partial r_1} = -2 \neq 0 \qquad \frac{\partial g_2(r_1, r_2)}{\partial r_1} = 2 \neq 0$$

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$$\frac{\partial g_1(r_1, r_2)}{\partial r_2} = -2 \neq 0 \qquad \frac{\partial g_2(r_1, r_2)}{\partial r_2} = 2 \neq 0$$

$$\frac{\partial \mathcal{L}}{\partial u} = 2u_1 + 2u_1 - 2u_1 + 2u_2 = 0$$

a= el, asak

0 = 0 Pt 812 - 67 F

24,59-22,001

2 No 19 - 1-11-0-

24,50 - 7-4252

(12-21) N S = 18,43

24, 14-274-0

24 (12/2-) -21/1-0

- VS+ NVS

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# Woundimentaritats bearinging

$$\lambda_1 \left( -2r_1 - 2r_2 + 30 \right) = 0$$
  $g_1 \left( r_1, r_2 \right)$ 
 $\lambda_2 \left( 2r_1 + 2r_2 - 60 \right) = 0$   $g_2 \left( r_1, r_2 \right)$ 
 $\lambda_1, \lambda_2 \geq 0$ 

#### 1. Fall

#### 2. Fall

$$2r_1 + 2r_2 - 60 = 0 \Leftrightarrow 2r_1 + 2r_2 = 60 \ \text{Z}$$

sofere

$$2v_1 \cdot (q - 2\lambda_1 = 0)$$

$$2v_1 \left(\frac{15v_2}{v_1 + v_2}\right) - 2\lambda_1 = 0$$

$$\lambda_1 = v_1 \cdot \left(\frac{15v_1}{v_1 + v_2}\right) > 0$$
Passt

4. Fall

$$R_1 = 0$$
,  $R_2 > 0$ 
 $2r_1 + 2r_2 - 60 = 0 \implies r_2 = 30 - r_1$ 
 $2v_1r_1 + 2R_2 = 0$ 
 $2v_2r_2 + 2R_2 = 0$ 
 $\Rightarrow v_1r_1 = v_2r_2$ 
 $\Rightarrow v_1r_1 = v_2 (30 - r_1)$ 
 $v_1r_1 = 30v_2 - v_2r_1$ 
 $r_1(v_1 + v_2) = 30v_2$ 
 $\Rightarrow r_1 = \frac{30v_2}{V_1 + V_2}$ ,  $r_2 = \frac{30v_1}{V_1 + V_2}$ 
 $2v_2r_2 + 2R_2 = 0 \Rightarrow 0$ 
 $2v_2r_2 + 2r_2 = 0 \Rightarrow 0$ 

Hinreidende Bedingung

$$\frac{\partial^{2} \chi}{\partial r_{1}^{2}} - 2v_{1}^{70} \frac{\partial^{2} \chi}{\partial r_{2}^{2}} = 2v_{2}^{70}$$

Tophwale Radie 
$$\frac{15 \vee 2}{\vee_1 + \vee_2} = r_1$$
  $\frac{15 \vee 1}{\vee_1 + \vee_2} = r_2$