

Mechanical Desktop

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MTI

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:(Displacer)

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: Q_{out} Q_{in} ()
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() Q_{out} Q_{in}
()
 Q_{out} ()
 Q_{in} ()
 $\varphi = 80^\circ$ ()

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$$Q_{out} = Q_{in} \quad (1)$$

$$P_c v_c = R_{air} T_c \quad (2)$$

$$P_h v_h = R_{air} T_h \quad (3)$$

$$P_c = P_h \quad (4)$$

$$s_c(\theta) = s_c(\theta - 1) \quad (5)$$

$$s_2 - s_1 = \int_{T_1}^{T_2} \frac{cp}{T} dT - \int_{P_1}^{P_2} \left(\frac{\partial v}{\partial T}\right)_P dP$$

$$0 = s_c(\theta) - s_c(\theta - 1) = cp \ln \frac{T_2}{T_1} - R_{air} \ln \frac{P_2}{P_1} \quad (6)$$

$$0 = cp \ln \frac{T_c(\theta)}{T_c(\theta - 1)} - R_{air} \ln \frac{P_c(\theta)}{P_c(\theta - 1)} \quad (7)$$

$$m_{total} = m_{cold-c.v} + m_{hot-c.v} = \frac{V_c}{v} + \frac{V_H}{v_h} \quad (8)$$

$$S_2 - S_1 = \int \frac{dQ}{T_{ave}} + S_{gen,sys}$$

$$: (S_{gen,sys} = 0)$$

$$S_2 - S_1 = \int \frac{dQ}{T_{ave}}$$

$$: Q_{in}$$

$$S_h(\theta) - S_h(\theta - 1) = \int \frac{dQ}{T_{ave}} + \Delta m_h \times s_c(\theta)$$

$$: T$$

$$T_{ave} = \frac{T_h(\theta) + T_h(\theta - 1)}{2} \Rightarrow \frac{dQ}{T_{ave}} = \frac{2Q_{in}}{T_h(\theta) + T_h(\theta - 1)}$$

$$\Delta m_H = m_h(\theta) - m_h(\theta - 1) = \frac{V_h(\theta)}{v_h(\theta)} - \frac{V_h(\theta - 1)}{v_h(\theta - 1)}$$

$$S_h(\theta) - S_h(\theta - 1) = \frac{2Q_{in}}{T_h(\theta) + T_h(\theta - 1)} + \left(\frac{V_h(\theta)}{v_h(\theta)} - \frac{V_h(\theta - 1)}{v_h(\theta - 1)} \right) \cdot s_c(\theta) \quad ()$$

$$s_h(\theta) - s_h(\theta - 1) = \frac{S_h(\theta) \cdot v_h(\theta)}{V_h(\theta)} - \frac{S_h(\theta - 1) \cdot v_h(\theta - 1)}{V_h(\theta - 1)} \quad ()$$

$$= c_p \ln \frac{T_h(\theta)}{T_h(\theta - 1)} - R_{air} \ln \frac{P_h(\theta)}{P_h(\theta - 1)}$$

$$S_c \quad T_c \quad T_h \quad v_c \quad v_h \quad P_c \quad P_h \quad V_c \quad V_h \quad S_h$$

$$x = \frac{S}{2} (1 - \cos \theta) + nS \left(\frac{\sin^2 \theta}{8n^2} \right)$$

$$n = \frac{L}{S} \quad \theta \quad S \quad L$$

$$Q_{in} = \frac{Q_{out}}{R_{air}} + \frac{Q_{in}}{c_p} + \frac{Q_{out}}{Q_{in}} \left(\frac{V_c}{V_h} \right) \left(\frac{V_c}{V_h} \right) \left[\frac{V_c}{V_h} \right]$$

$$c_p = \frac{1}{29} [28/11 + 0/1967 \times 10^{-2} \times T(\theta) + 0/4802 \times 10^{-5} \times T^2(\theta) - 1/96 \times 10^{-9} \times T^3(\theta)]$$

$$V_{hot} = \left[\frac{S_d}{2} (1 - \cos\theta) + nS_d \left(\frac{\sin^2\theta}{8n^2} \right) \right] A_d + \left[\frac{S_p}{2} (1 - \cos(\theta - \phi)) + nS_p \left(\frac{\sin^2(\theta - \phi)}{8n^2} \right) \right] A_p + V_{element}$$

$$+ V \quad + V \quad + V$$

(displace piston) ϕ (Power piston) S
 80°

$$V_c = S_d - \left[\frac{S_d}{2} (1 - \cos\theta) + nS_d \left(\frac{\sin^2\theta}{8n^2} \right) \right] A_d + V_{coil}$$

$$+ V \quad + V$$

$$\dot{V}_c = \frac{-\pi \times S_d \times rpm}{60} \left[\sin\theta + \frac{1}{2n} \sin\theta \cos\theta \right] A_d$$

$$\dot{m}_c(\theta) = \frac{\dot{V}_{cold}}{v_c(\theta)}$$

18

$$Q_{out} = \left(\frac{T_h(\theta) + T_c(\theta)}{2} - T_{wall} \right) . h . A_{tubes} . \Delta t \times \frac{1}{1000} \quad (kj)$$

rpm
6 mm
291° K

$$Nu = 5 + 0.025 \times (Pr \times Re)^{0.8}$$

$$h = \frac{Nu \cdot k}{D}$$

: k
: Nu
(0.006 m) : D
: h
T_{wall}

Nu

$$Re = \frac{4 \dot{m}_c}{18 \mu \pi D}$$

Pr k μ
Mathematica)

(interpolating polynomial
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$$\dots g(x, y, z, \dots) = 0 \quad f(x, y, z, \dots) = 0 \quad []$$

$$\dots \left(\frac{\partial f}{\partial y} \quad \frac{\partial f}{\partial x} \right)$$

$$\dots \left(\frac{\partial g}{\partial y} \quad \frac{\partial g}{\partial x} \right)$$

$$0 = g(x_1, y_1, z_1, \dots) + \frac{\partial g}{\partial x} \Big|_{x_1, y_1, z_1, \dots} \times \alpha + \frac{\partial g}{\partial y} \Big|_{x_1, y_1, z_1, \dots} \times \beta + \dots \quad ()$$

$$\dots \gamma \beta \alpha$$

$$\dots \beta \alpha$$

$$X_2 = x_1 + \alpha$$

$$Y_2 = y_1 + \beta$$

$$Z_2 = z_1 + \gamma$$

$$\varepsilon \quad \dots \quad z_n \quad y_n \quad x_n$$

:

$$\varepsilon = [f(x_n, y_n, z_n, \dots)]^2 + [g(x_n, y_n, z_n, \dots)]^2 + \dots$$

Mathlab-6.0

$$T = 298.15^\circ \text{K} \quad P = 100 \text{ kPa}$$

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VCN150

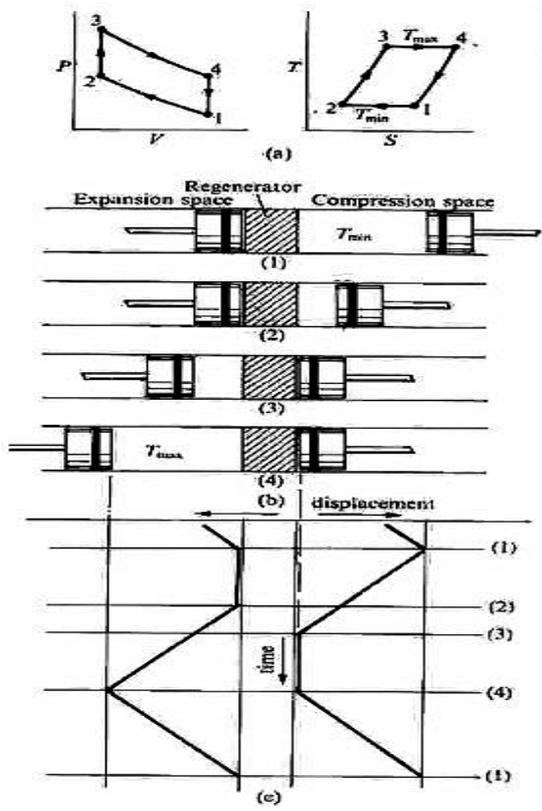
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51 mm	
33 mm	(Displacer)
51 mm	
65 mm	(Displacer)
2.042 cm ³	
3.318 cm ³	
15.19 cm ³	
17.14 cm ³	
13.85 cm ³	
30 cm ³	
1200 watt	
6 mm	
air	
80°	
102 mm	
64 mm	
2	



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