WEEK 9: *PERFORMANCE CHARACTERISTICS OF SIMILAR OPERATING POINTS*

PERFORMANCE CHARACTERISTICS OF SIMILAR OPERATING POINTS

In this section, the affinity law and conclusions reached by keeping them constant are investigated.

Two important cases,

1) When the same turbomachine is operating at different rotational speeds

2) When the geometrically similar turbomachines are operating at the same rotational speeds, discussed.

1) The same turbomachine operating of different rotational speeds

d=constant

$$w = \frac{2\pi N}{60}$$

$$\Pi_Q = \frac{Q}{wd^3}$$

$$\Pi_Q{}' = \frac{Q}{N}$$

$$\Pi_h = \frac{gh}{w^2 d^2}$$

$$\Pi_h{}' = \frac{gh}{N^2}$$

$$\Pi_P = \frac{P}{w^3 d^5}$$

$$\Pi_P{}' = \frac{P}{N^3}$$

2) Geometrically similar turbomachines operating at same rotational speed

Affinity laws for the constant N:

$$\Pi_Q = \frac{Q}{Nd^3}$$

$$\Pi_Q{}'' = \frac{Q}{d^3}$$

$$\Pi_h = \frac{h}{N^2 d^2}$$

$$\Pi_h{}'' = \frac{h}{d^2}$$

$$\Pi_P = \frac{P}{N^3 d^5}$$

$$\Pi_h{}'' = \frac{P}{d^5}$$

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