Purchase Equipment Cost (PEC)

The procedure for the estimation of PEC for the various components of gas turbine and steam turbine power plant are given in this Appendix. Section H.1 [117] gives the necessary relation pertaining to components of gas turbine plant while section H.2 [139] gives that of steam turbine power plant.

Table H.1 Gas turbine power plant

Compressor

$$PEC_{AC} = \left(\frac{C_{11}\dot{m}_a}{C_{12}-\eta_{AC}}\right)\left(\frac{P_2}{P_1}\right)\ln\left(\frac{P_2}{P_1}\right)$$

$C_{11} = 39.5\$/(\text{kg/sec})$, $C_{12} = 0.9$

Combustion chamber

$$PEC_{CC} = \left(\frac{C_{21}\dot{m}_a}{C_{22}-\frac{P_4}{P_3}}\right)\left[1+\exp\left(C_{23}T_4 - C_{24}\right)\right]$$

$C_{21} = 25.6\$/(\text{kg/sec})$, $C_{22} = 0.995$

$C_{23} = 0.018(\text{K}^{-1})$, $C_{24} = 26.4$

Gas Turbine

$$PEC_{GT} = \left(\frac{C_{31}\dot{m}_g}{C_{32}-\eta_{GT}}\right)\ln\left(\frac{P_4}{P_5}\right)\left[1+\exp\left(C_{33}T_4 - C_{34}\right)\right]$$

$C_{31} = 266.3\$/(\text{kg/sec})$, $C_{32} = 0.92$

$C_{33} = 0.036(\text{K}^{-1})$, $C_{34} = 54.4$

Air preheater

$$PEC_{aph} = C_{41}\left(\frac{\dot{m}_g(h_5-h_6)}{U\Delta T_{lm,aph}}\right)^{0.6}$$

$C_{41} = 2292\ \$/(m^{1.2})$, U=18 kW/m^{2}K

HRSG

$$PEC_{hrsg} = C_{51}\left[\left(\frac{\dot{Q}_{ec}}{\Delta T_{lm,ec}}\right)^{0.8} + \left(\frac{\dot{Q}_{ev}}{\Delta T_{lm,ev}}\right)^{0.8}\right] + C_{52}\dot{m}_{st} + C_{53}\dot{m}_g^{1.2}$$

$C_{51} = 3650\ \$/(\text{kW/K})^{0.8}$, $C_{52} = 11820\ \$/(\text{kg/sec})$

$C_{53} = 658\ \$/(\text{kg/sec})^{1.2}$

Table H.2 Steam Turbine Power Plant

Boiler	$I_{BL} = 740(h_s)^{0.8} \exp\left(\frac{P-2}{14.29}\right)\exp\left(\frac{T-350}{446}\right)$ h_s enthalpy transfered to steam in kW p boiler pressure in MPa T boiler temperature in °C
Steam Turbine	$I_{ST} = 6000(E_P)^{0.7}$ E_P power generated in kW
Condenser	$I_{COND} = 1773(m_s)$ m_s steam flow rate in kg/sec
Pump	$I_{PUMP} = 3540(W_P)^{0.71}$ W shaft work in kW