### Types of costs associated

#### Labor cost

It is usually the largest cost factor in any fabrication process. Equation (1) and equation (2) are used for calculating the labor cost. The operator factor is taken into consideration for set up time, electrode and filler change over time etc.

$$Labor cost=Total welding time × \frac{Labor and overhead cost }{hour} (1)$$

$$ Total welding time= \frac{Arcing time}{Operator factor} (2)$$

#### Filler metal cost

The filler metal cost includes three factors i.e. weight of filler metal deposits that depends on size of the groove, filer metal cost and deposition efficiency. Deposition efficiency in TIG welding is nearly equal to 100 % because of no/very less filler metal is lost through spatter, vaporization or stub end loss. Equation (3) is used to calculate the filler metal cost.

$$Filler metal cost= \frac{Weight of deposites ×Filler metal cost per unit}{Deposition efficiency} (3)$$

#### Shielding gas cost

The calculation for cost of shielding gas involves arc time, gas flow rate and the cost for the type of shielding gas. Equation (4) is used for shielding gas cost calculation.

$$Shielding gas cost= Arc time ×Gas flow rate × \frac{Cost of gas}{volume}… ……. (4)$$

#### Power consumption cost

Power consumption cost is calculated in same way for both welding processes. Equation (5) is used for calculation of cost of power consumption.

$$Power consumption cost= \frac{Welding current ×Welding voltage }{Power source efficiency} ×Arc time ×\frac{Power cost}{kW.h}…. (5)$$

#### Flux cost

In A-TIG welding, activated flux paste is applied on plates before welding. Therefore, cost of flux is an additional cost involved only with A-TIG welding process. Equation (9) is used for calculation of flux cost.

$$Flux cost =\left(Weight of flux powder ×cost of flux\right) +\left(Volume of acitone× cost of acetone\right)….. (9)$$

 For cost calculation, per unit cost of consumables and services were considered as:

labor cost= 100 Rs./h, filler wire= 3700 Rs./Kg, Ar gas= 100 Rs./L, electricity= 8 Rs./kWh, TiO2 powder= 200 Rs./kg and acetone cost= 600 Rs./L.