Motor loading = 39.7 A / 52.6 A = 75% load

The third is the slip method. Whereby the load is determined by comparing the slip measured when the motor is operating with the slip for the motor at full load. The accuracy of this method is limited but it can be used with the use of a tachometer only—meaning no power analyser is needed.

Slide 27: Calculating Load From Input Power
The input power measurement is the most common method. There are three steps:
1. Determine the input power at actual load conditions (Pinput)
2. Determine the input power at full load conditions (Pfull)
3. Calculate the load

Slide 28: Calculating Input Power
Here is how we would calculate the actual input power being drawn from the electrical measurements with the power analyser.

$$P_{input} = \frac{V * I * PF * \sqrt{3}}{1000}$$

Where:
Pinput = Three phase input power in kW, calculated from measurements taken at actual load conditions
V = RMS (root mean square) voltage in volts, mean line to line of 3 phases
I = RMS current in amps, mean of 3 phases, and
PF = the Power factor as a decimal

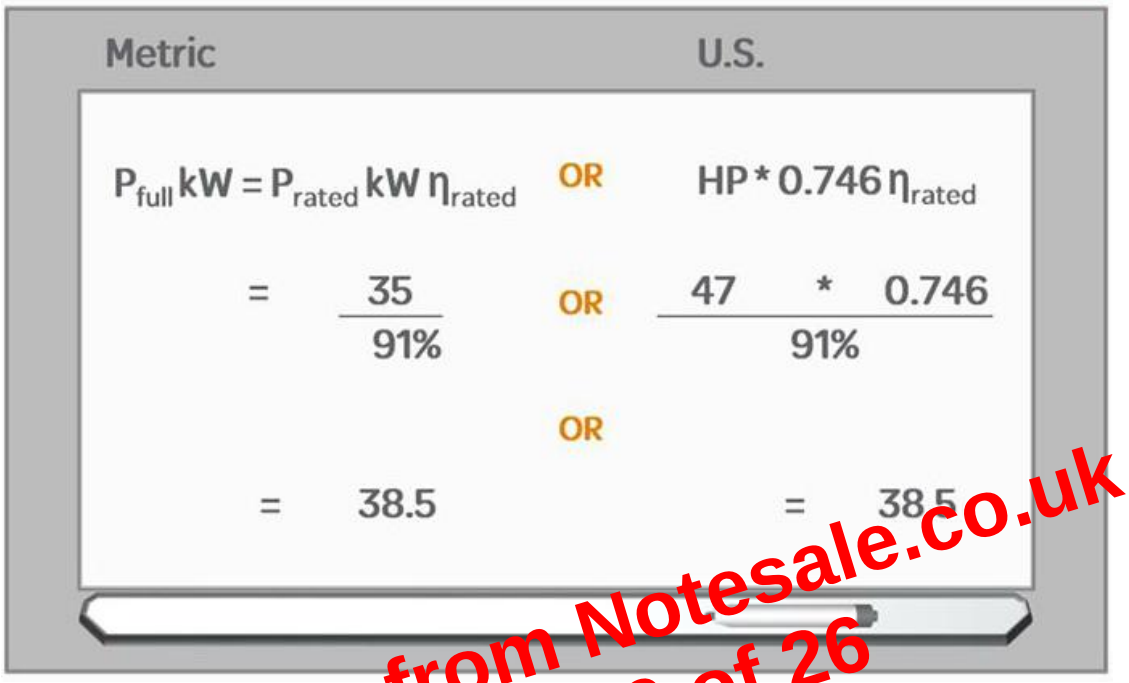
Slide 29: Determining Output Power
Here's how we would calculate the power used at full load.

$$P_{full} = \frac{P_{rated}}{\eta_{rated}} = \frac{HP * 0.746}{\eta_{rated}}$$

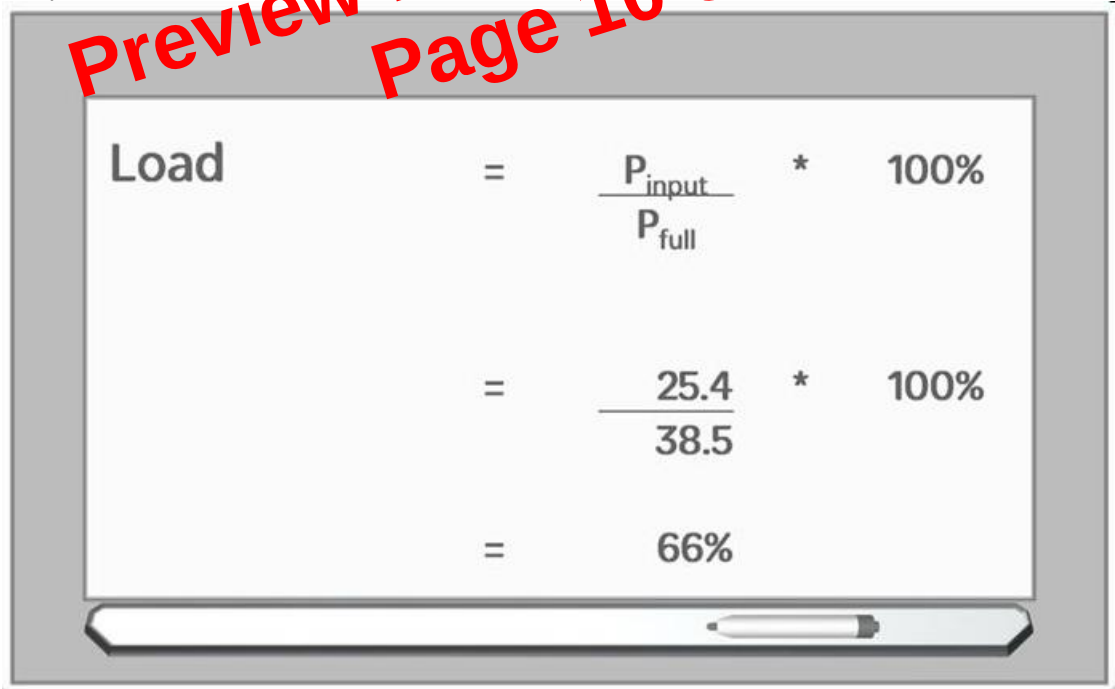
P_{full} = Input power in kW, used at full rated load
η_{rated} = Efficiency at full rated load
P_{rated} = Nameplate rated mechanical power output in kW
HP = The nameplate rated mechanical power output in horsepower

If the nameplate gives mechanical output in horsepower rather than kW, it can be converted by multiplying the

Then we use the equation for the input power at full rated load. Here we are showing the metric and US versions.



Finally we calculate the load.



Where we find that the answer is 66%.

Fully Loaded Cost Metric

Motor details

Motor rated mechanical power	25.0	kW		
Operating hours	24	hours per day	365	days per year
Load	100%			
Rated efficiency	94%			

Electrical tariff

Demand charges	9.00	€ / kW
Energy charges	0.045	€ / kWh
Utility sales tax	6%	

Annual operating hours = 24 hours/day * 365 days/year

= 8760 hours/year

Since:

Efficiency = $\frac{\text{Power}_{output}\ \text{kW}}{\text{Power}_{input}\ \text{kW}}$

Partially Loaded Cost Metric

Motor details

Motor rated mechanical power	20	kW
Operating hours	6200	hours per year
Load	75%	
Rated efficiency	90%	

Electrical tariff

Average energy cost	0.075	€ / kWh

$$Power_{input} = \frac{Power_{output}\ kW}{Efficiency} * Load$$

$$= \frac{20\ kW}{90\%} * 75\%$$

$$= 16.67\ kW$$

$$Cost = Power_{input}\ kW * Operating\ hours\ \frac{hours}{year} * Cost\ \frac{€}{kWh}$$