

Title: AIR CONSUMPTION COSTS

Based on a power cost of £0.09 per kWh*, the annual compressed air cost for a typical plant demand of 500 l/s (1000 cfm) at 7 barg, delivered by a 165 kW compressor operating at 75% on-load, is £30,102 when operating 48 hours per week. **

The quiescent air consumption of an EL Positioner does not exceed 0.166 l/s.

The cost of continuous quiescent EL air consumption may be estimated as follows:

$$\frac{£30,102}{(500 \text{ l/s} \times 0.75)} \times 0.166 \text{ l/s} = £13.33 \text{ p.a.}$$

If operated in the quiescent state continuously 24 hours per day throughout the year, the cost rises to £46.64 p.a.

Since the purpose of positioners is to modulate, it is unlikely that units will spend more than a fraction of their operating time in the quiescent state.

When modulating, all positioner devices consume the air necessary to move the actuator and quiescent air usage is not significant.

Derivation of compressed air cost above: **

$$\text{Full load cost (£)} = \text{Rated Motor Power (kW)} \times \text{Service Factor} \times \text{Hours in operation} \times \text{Electricity Cost (£/kWh)} \times \text{Full load Utilisation}$$

£27,799 = 165kW x 1.0 x 2496hrs x 0.09 £/kWh x 0.75

$$\text{No load cost (£)} = \text{No load Motor Power(kW)} \times \text{Service Factor} \times \text{Hours in operation} \times \text{Electricity Cost (£/kWh)} \times \text{No load Utilisation}$$

£2,303 = 41kW x 1.0 x 2496hrs x 0.09 £/kWh x 0.25

$$\text{Total Energy Cost (£)} = \text{Full load cost (£)} + \text{No Load cost (£)}$$

£30,102 = £27,799 + £2317

Explanation of terms:

Rated Motor Power (kW) : Published by compressor manufacturer (Use 0.746kW/bhp to convert from bhp to kW)

No load Motor Power (kW): Published by compressor manufacturer (Use 0.746kW/bhp to convert from bhp to kW)

Service Factor: An estimate of the overload that a motor can withstand without reduced life expectancy. (A service factor of 1.0 reflects relatively high compressor utilisation.)

Full Load Utilisation: Proportion of total running time spent operating at full load (%/100)

No Load Utilisation: Proportion of total running time spent operating at no load (%/100)

References:

* Quarterly Energy Prices Tables Annex – Table 3.1.2 and Notes (published by the UK Department for Business, Energy & Industrial Strategy, 09/2018)

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