

GOING GREEN WITH DRY MECHANICAL VACUUM PUMPS

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Vacuum plays an important role in processes used in chemical production as well as the power industry. The requirements are similar regardless of the application: reduced production costs, low equipment maintenance and minimal power consumption.

For a vacuum process in the power or chemical industry two types of vacuum pump systems are typically used:

1. Steam ejector systems – using multi-stage high pressure steam ejectors supported by water sealed liquid ring or oil-sealed pumps.
2. Dry mechanical systems – using multi-stage mechanical boosters supported by completely dry primary vacuum pumps.

Large multi-stage steam ejector systems, backed by liquid ring or oil-sealed pumps have been used historically. However, these are energy inefficient and rely on high steam quality for consistent performance.

The completely dry pump system has proven to be the most effective. The cost saving is significant, as shown in the example on the next page. Combined with a cleaner and stable vacuum level, this leads to an overall process improvement, whilst costs are reduced significantly.



Why Mechanical Pumps?

Cost savings

Lower power and operating costs

Reduced effluent costs

No effluent, no polluted waste disposal

Flexible operation

Improved processing

Clean vacuum

No contamination of pumped gases or vapours

Consistent processing

Reliable and dependable vacuum level

COST OF OWNERSHIP COMPARISON

Dry mechanical vacuum pumps vs. steam ejector/LRP system (example operating conditions on a deodorisation process)

Suction pressure = 0.5 mbar(a)

Required capacity at process pressure = 20,000 m³/h

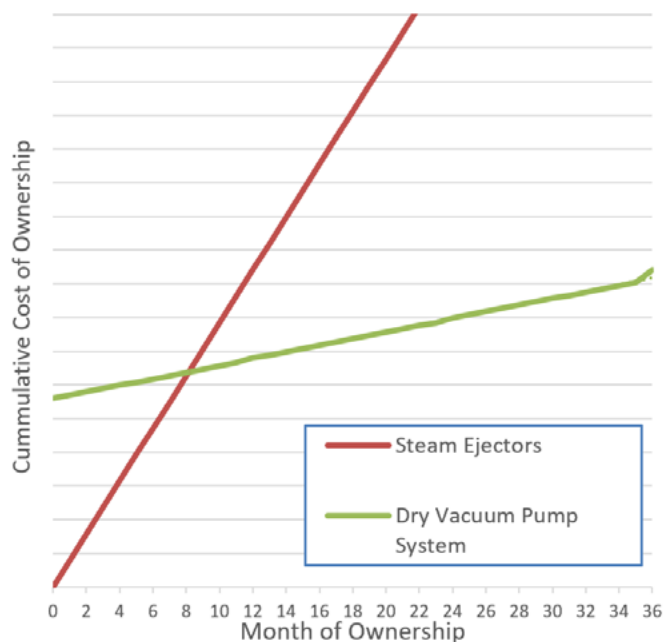
Suction temperature = 70 °C

Operating time per year = 329 days

Operating time per day = 24 hours

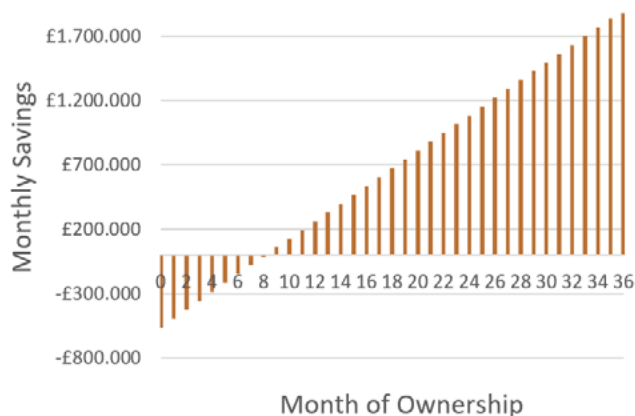
Utilisation = 90 %

COST CRITERIA	SPECIFIC COSTS	STEAM EJECTOR / LRP SYSTEM	EDWARDS DRY PUMP SYSTEM
Consumption			
Power	0.12 £/kWh	£14,212.80	£111,333.60
Steam	0.06 £/kg	£829,080.00	£13.05
Cooling water	0.05 £/m ³	£83,760.77	£1,231.78
Air / nitrogen	0.09 £/m ³	£0.00	£2,435.25
Effluent	0.12 £/m ³	£13,818.00	£0.00
Caustic soda	0.12 £/m ³	£0.00	£0.60
Subtotal annual consumption		£940,871.57	£115,014.28
Maintenance			
Annual maintenance costs as part of a 3-year maintenance programme)			£12,333.00
Total		£940,871.57	£127,347.28



Cost of ownership comparison – steam ejector / LRP system vs. Edwards dry pump system.

Payback period = 8 months
Saving thereafter = £80,000 per month



Projected monthly savings for the calculation example (£/month).