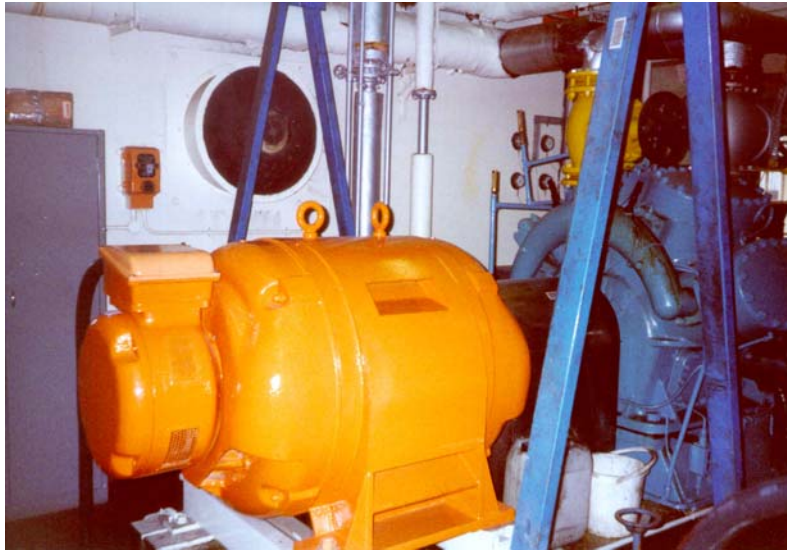


## Evaluation of NH<sub>4</sub> Compressor Nr. 14 at Scottish and Newcastle Breweries

In support of our proposal that EnviroStart be used on the refrigeration compressors within Scottish and Newcastle Breweries we have conducted a number of evaluations of both the soft start and also of the energy saving characteristics of the system combination.



**NH<sub>4</sub> Compressor 14**

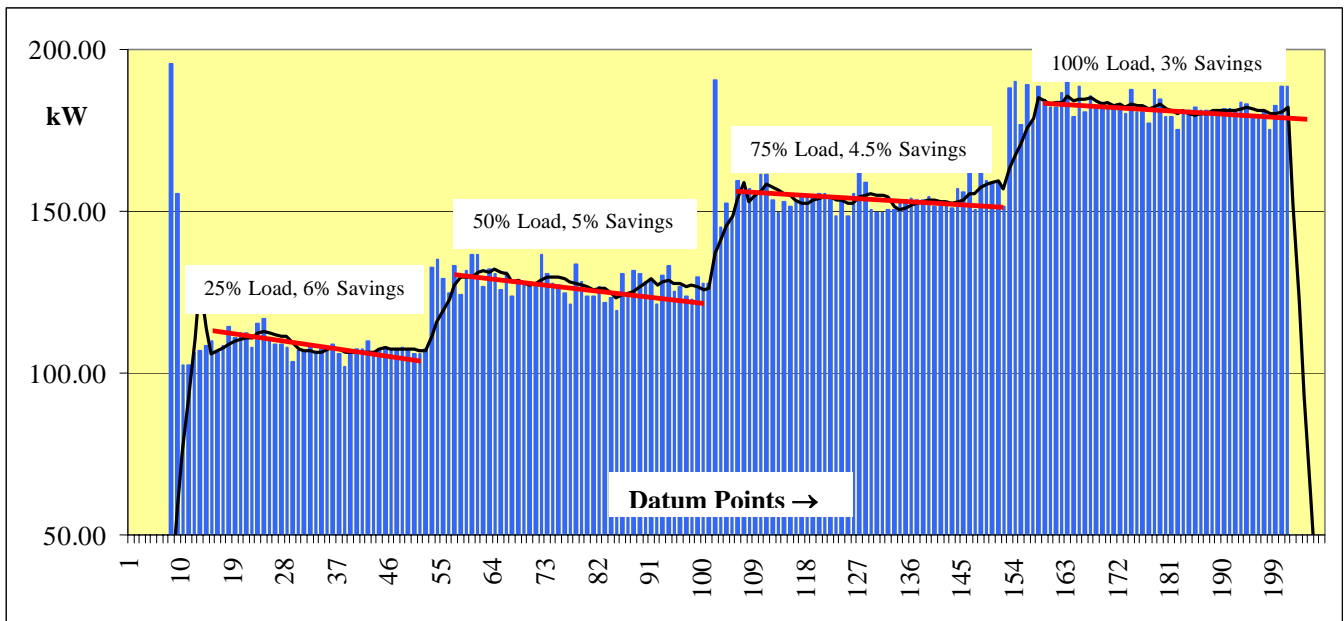
EnviroStart was integrated into the motor control and a full spectrum evaluation of the motor characteristic was conducted at all load levels including that incurred using the “auto” facility which invokes the compressor cascade. The unit was operating effectively as a soft start including management of the rotor resistance switching, however, because of magnetisation transfer flux variations during run the enabling of optimisation on EnviroStart created heterodyning at anything other than 100% load levels. This was corrected by adjusting the “transfer measurement characteristics” and “back stop voltage points” within the control software of EnviroStart. With the adjustments made to the software the unit operated smoothly at all levels. In the period from installation in 2001 the unit has proven to be both reliable and rugged, operating without issue.

Operating measurements were taken and validated by Scottish and Newcastle Brewery. The derived data demonstrated savings of between 15 and 23% according to the various load levels. These derivation measurements account for reflected voltage variation at the EnviroStart supply to the motor. This would be the true reflection of energy saving should all major systems on the sub-station feed be fitted with EnviroStart. If this is not the case then the un-compensated measurements must be used which do not reflect the voltage drop but only the current change.

In November 2001 we attended S & N once again to fully data capture and log the results that are being given by the system as now installed. There has been no cause for concern regarding the unit’s operational capability as it has been in virtually continuous use since it’s “full commissioning” in May.

The results shown below give both the derived and also the un-compensated measurements. In each case the payback period for EnviroStart is given which shows that even with the apparently lower un-compensated figures, payback periods are still well within expectation. The secondary benefits of EnviroStart should also be taken into account in that the unit is managing the soft start and limiting current excursion and contactor wear at switch-on without detrimenting starting torque, EnviroStart is also soft load switching which is significantly reducing the stress on bearings and the rotor, both of which will reflect into extended motor life.

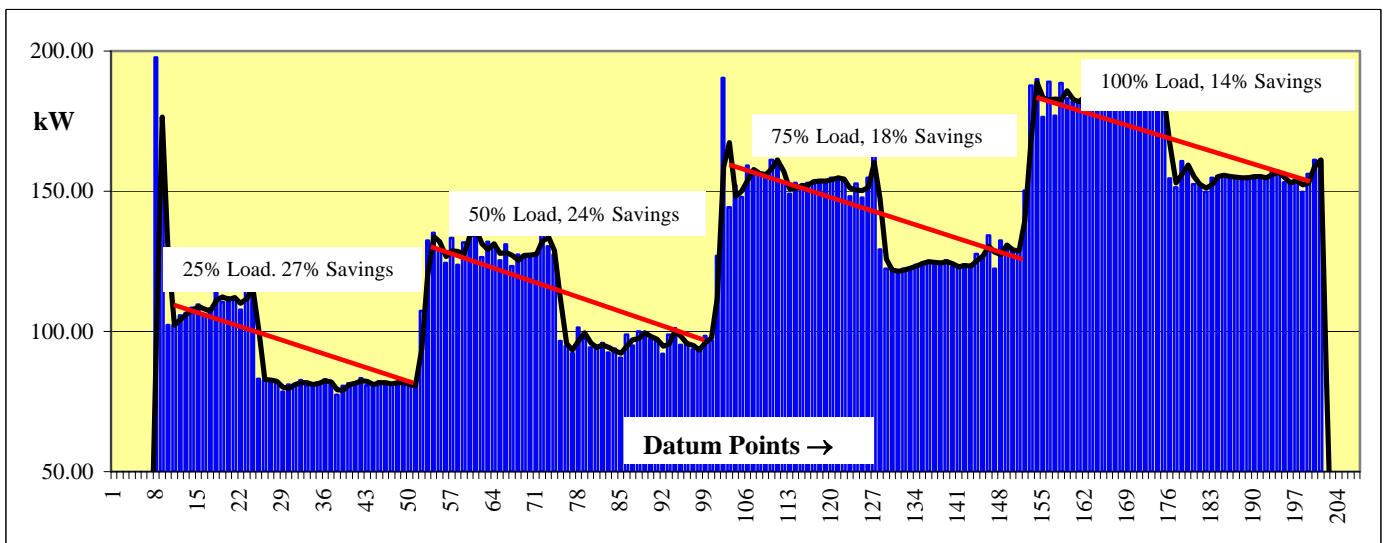
## Un-compensated kW Measurement. (No account of voltage drop)



### Payback Assumptions:

Based on the logged “auto configuration” loading being either at 75% or 25% for >80% of the time the mean savings given will be  $\geq 5.4\%$ . Based on given energy costs of £0.037p/kWh and the current price of a EnviroStart 400-TPMEC-260 of £3,900/unit the payback period calculated will be  $\leq 1.67$  years.

## Derived kW Measurement. (Taking into account the voltage drop at the motor)



### Payback Assumptions:

Based on the logged “auto configuration” loading being either at 75% or 25% for >80% of the time the mean savings given will be  $\geq 18\%$ . Based on given energy costs of £0.037p/kWh and the current price of a EnviroStart 400-TPMEC-260 of £3,900/unit the payback period calculated will be  $\leq 0.7$  years.

The two payback calculations have been based on the actual data measured and the figures given for running costs and running times. Loading was checked by reference to the refrigeration log held in the compressor room. It would be expected that any similar slip ring motor compressor on this site would demonstrate similar savings levels and thus similar payback periods.

