Bronz-Glow Test Case 1

Energy Savings on Coil Refurbishment

Porto Rico

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1. Introduction
This case reviews the impact of a coastal atmosphere and the deterioration rate and increase of energy consumption of a air-cooled condenser.
A simple current draw reading (amps) before the coating process and after the coating process concluded an instant energy consumption decrease of 23%. This study aims to present the enormous increase in energy efficiency when the condenser coils are protected and coated with Bronz-Glow Gold Coat.
There are two scenarios laid out in this study, the first being the immediate energy gains of a coil refurbishment of which results are concluded from actual current draw readings.
The second scenario is a comparison of power consumption over time of coated and non-coated coils.

Engineering Data
The air sided heat exchanger performance depends on the pressure drop (ΔP) of the airflow through a coil and heat conductivity or K-value(ΔK) or heat exchange capacity of the coil. These two parameters together determine the actual performance compared to the nominal performance of the coil.
Performance (%) = (Δ Po / Δ Pt) x (Δ Ko / Δ Kt)
The K- Value and pressure drop are influenced by:

- The rate of galvanic corrosion
  (the rate at which the bi metallic coupling is dissolved due to the presence of an electrolyte like salt and water).

- Insulation factor of dust and dirt adhesion.

- Direct general deterioration of the heat exchange surface.

- Blocking of the airway due to corrosion and fouling.

For each 1 degree Celsius rise in discharge temp there is an increase in power consumption of 1.75%.

For each 1 degree Celsius rise in discharge temp there is a decrease in cooling capacity of 1.1%.

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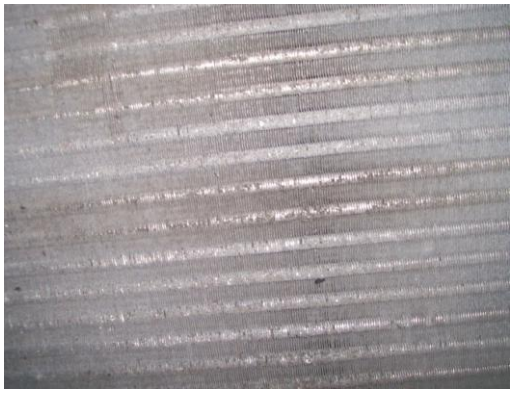
2. Actual Situation

A standard condensing unit was chosen for the test case because this unit was only installed 18 months ago.

The condenser coils are 2 row 12 fpi coils.

The coating was applied on site, on the roof of the building. The condenser fan's were removed to allow access to the inside surfaces of the coil.

At no time were any electrical components disturbed or the refrigerant circuit compromised or affected in any way. The Unit was isolated for two periods of 30 minutes, one period for deep cleaning and one period for coating, once dry.



Before

After Deep Clean

After Treatment

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3. Instant Energy Savings

Results Before Coating After Coating

Ambient Air Temp	87F	88F
Room Temp	76F	78F
Liquid Pressure	250psi	235psi
Suction Pressure	74psi	70psi
Discharge Temp	195.5F	172.5F
Suction Line Temp	66F	68F
Liquid line Temp	109F	101F
Condenser Air out Temp	110F	115F
Room supply air Temp	65.2F	67.2F
Comp Amp Reading	34.2A	26.4A

Taking only the current draw readings from the table we can see the immediate increase in efficiency of the condenser has led to approx 23% savings in electrical consumption. This calculation will not take into account additional energy savings made from increased cooling capacity due to lower discharge temperatures caused by increased heat exchange from the condenser.

Before coating

12 hours run time per day, 6 days per week,
51 weeks per year. = 3672 hours run time per year.

At efficiency of 1.68 Kw per ton = 1.68 Kw x 9.3 tons x 3672 hours = 57371.33 Kw per year
at a rate of £0.11 per Kw = **£6310.85** per year cost of electricity.

After coating

12 hours run time per day, 6 days per week,
51 weeks per year. = 3672 hours run time per year.

At efficiency of 1.29 Kw per ton = 1.29 Kw x 9.3 tons x 3672 hours = 44052.98 Kw per year
at a rate of £0.11 per Kw = **£4845.72** per year cost of electricity.

Savings

£6310.85 – £4845.72 = **£1,465.13**

Conclusion

The payback time of a condenser refurbishment onsite is approx 8-12months months.
Not forgetting all coils refurbished carry a minimum 3 year warranty on Bronz-glow coatings.
All cases are different due to size of units, amount of degradation that has occurred and how often the system is running, however Bronz-Glow can always guarantee positive results.

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4. Energy Savings on treatment before installation.

Follows a survey on a “would be” scenario if the air-cooled condenser would have been coated before installation and a mild corrosive environment would be taken into account.

This case study will demonstrate the energy saving that can be achieved over a period of five years on a standard air-cooled condenser, if Bronz-Glow coil coating had been applied at the beginning of operations.

Since the energy savings are at the forefront of governmental concerns, respectable companies and consumers, more attention to the energy consumption increase due to the inefficiency of heat exchanging coils is more than justified.

Assumptions

- Costal environments are classed as a high corrosive area, where condenser coils have a very short “nominal performance” lifetime. Based on this, the following assumptions used in the calculation are not “worst case scenario”
- The condenser capacity will decrease by minimum 32% in five years.
- The coil replacement takes place each five years.
- Costs of coil replacement average: £1200 per coil, Installation and commissioning.
- Running hours are converted to an average of full load hours per year. If running hours are i.e. 10 hours full load and four hours 50%, we calculate 12 hours.
- Power cost are calculated by average energy cost, £0.11 per kwH.
- Power consumption based on 1.2kw per ton unit.(New)

Un-coated coil

The un-coated coil technical depreciation time is Five years. The efficiency loss will be 8% a year, which is a non-realistic assumption in reality, for most coastal sites the rate of depreciation is at least three as fast. We realize this figure to be proportional, but the linearity reflects a scenario taking the time value of money into account.

Coated coil

Bronz-Glow coated coils will not be affected in their performance by a margin in excess of 1% throughout its life cycle.
Factors : Systems at 1.2 Kw per ton.

Running time : 12 hours per day at 5 days per week = 3,120 hrs per year
Capacity : 1.2 Kw per hour for 9.3 ton = 34,819 Kwh per year
Energy costs : Each Kwh = £0.11
Yearly power usage : £3,831

Uncoated

Unit	New power usage	Year 2	Year 3	Year 4	Year 5
Condenser	34,819 Kwh	37,604 Kwh	40,613 Kwh	43,862 Kw	47,371 Kwh

Total power usage for 5 years : 204,270 Kwh

At £0.11 per Kwh total 5 year cost : **£22,470**

Coated with Bronz-Glow Gold Coat

Unit	New power usage	Year 2	Year 3	Year 4	Year 5
Condenser	34,819 Kwh	35,167 Kwh	35,519 Kwh	35,874 Kwh	36,232 Kwh

Total power usage for 5 years : 177,612 Kwh

At £0.11 per Kw total 5 year cost : **£19,537**

Conclusion

Operating costs **uncoated coil** over 5 years = £22,470 = **£4,494** per year

Operating costs **coated coil** over 5 years = £19,537 = **£3905** per year

SAVINGS of **£589** per year on just this 9.3 ton unit.

This would calculate to savings of approx **£64** per Ton per year.