ADRES *HVAC Control*

Comparing a Call for Cooling With and Without the Energy Recovery
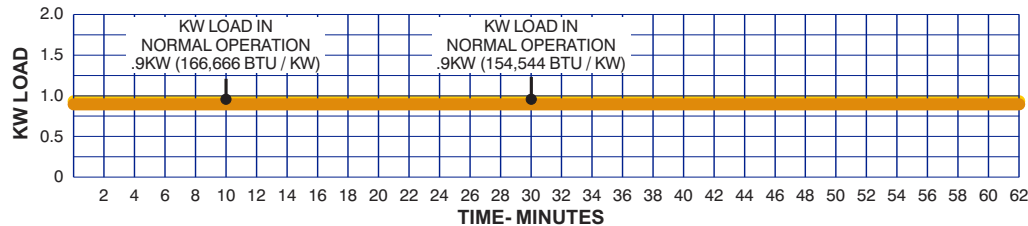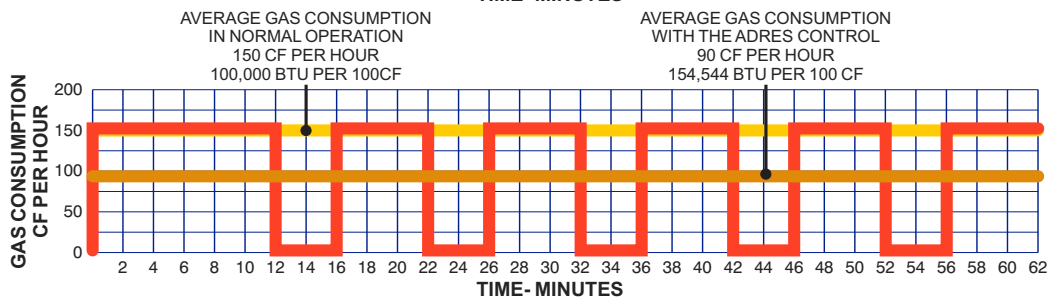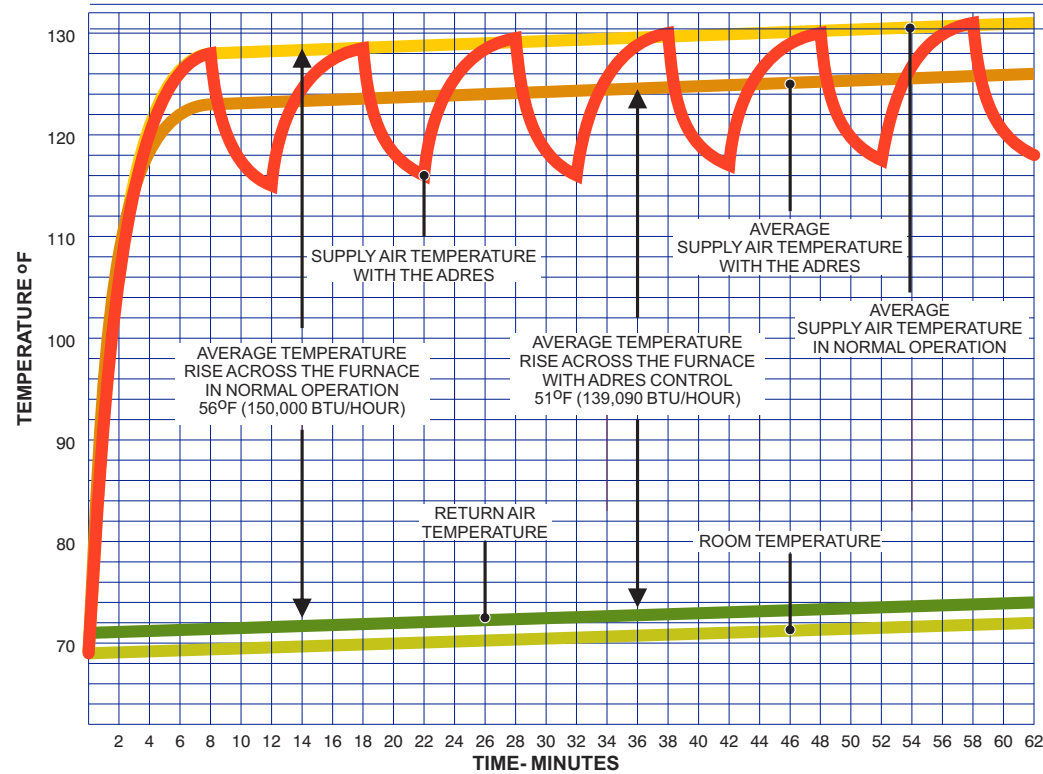

Example is based on a typical 5-Ton Air Conditioning system.

■ During the call for cooling, the room temperature drops from 75 to 72°F.

■ The return air entering the air conditioner is generally 2 or more degrees warmer than room temperature due to the ducts being heated and the make-up rooftop air.

■ In normal operation without the ADRES, the supply air is colder because the compressor runs continuously and keeps the temperature drop across the coil at its maximum of 20°F and the maximum 60,000 BTU per hour is provided.

■ With the ADRES operating, the supply air temperature is modulated as the compressor is turned on and off by the ADRES.

■ With the ADRES operating, the temperature drop across the coil is decreased by about 2.5°F with a corresponding decrease in BTU output to an average of 52,500 BTU per hour.

■ With the system operating normally without the ADRES, the load is 8.5 KW and the efficiency of the system is 7,058 BTU per KWH.

■ With the ADRES operating, the load varies
■ from 8.5 KW when the compressor is operating to only 1.5 KW in energy recovery with just the indoor fan operating. Efficiency has increased to 9,210 BTU per KWH-- an improvement of 30%.

ADRES *HVAC Control* — Comparing a Call for Heating With and Without the Energy Recovery

TEMPERATURE °F (vertical axis: 70, 80, 90, 100, 110, 120, 130)

SUPPLY AIR TEMPERATURE WITH THE ADRES

AVERAGE SUPPLY AIR TEMPERATURE WITH THE ADRES

AVERAGE SUPPLY AIR TEMPERATURE IN NORMAL OPERATION

AVERAGE TEMPERATURE RISE ACROSS THE FURNACE IN NORMAL OPERATION 56°F (150,000 BTU/HOUR)

AVERAGE TEMPERATURE RISE ACROSS THE FURNACE WITH ADRES CONTROL 51°F (139,090 BTU/HOUR)

RETURN AIR TEMPERATURE

ROOM TEMPERATURE

TIME- MINUTES (2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62)

GAS CONSUMPTION CF PER HOUR (vertical axis: 0, 50, 100, 150, 200)

AVERAGE GAS CONSUMPTION IN NORMAL OPERATION 150 CF PER HOUR 100,000 BTU PER 100CF

AVERAGE GAS CONSUMPTION WITH THE ADRES CONTROL 90 CF PER HOUR 154,544 BTU PER 100 CF

TIME- MINUTES

KW LOAD (vertical axis: 0, 0.5, 1.0, 1.5, 2.0)

KW LOAD IN NORMAL OPERATION .9KW (166,666 BTU / KW)

KW LOAD IN NORMAL OPERATION .9KW (154,544 BTU / KW)

TIME- MINUTES

Example is based on a typical 150,000 BTU Gas Furnace.

- During the call for heating, the room temperature rises from 69 to 72°F.

- The return air entering the furnace may be higher or lower than the room temperature depending on the location of the return ducts. A warmer return air temperature (worst case) is assumed for the analysis.

- In normal operation without the ADRES, the supply air is warmer because the gas burner runs continuously and keeps the temperature drop across the furnace or heat exchanger at its maximum of 56°F and the maximum 150,000 BTU per hour is provided.

- With the ADRES operating, the supply air temperature is modulated as the gas valve is turned on and off by the ADRES.

- With the ADRES operating, the temperature drop across the furnace is decreased by about 5°F with a corresponding decrease in BTU output to an average of 139,090 BTU per hour.

- With the system operating normally without the ADRES, the gas consumption is 150 CF per at an efficiency of 100,000 BTU per 100 CF of gas. The KW load is .9KW for the indoor fan operating at low

- With the ADRES operating, the average gas consumption drops to 90 CF of gas per hour and the efficiency increases to 154,544 BTU per 100 CF of gas. The electrical load efficiency decreases slightly from 166,666 BTU/KW to 154,544 BTU/KW.

	Normal Operation	Operation with ADRES
Gas Consumption	$.75	$.45
KWH Consumption	$.09	$.09
BTU Output	150,000	139,090
Total Cost per 100,000 BTU	$.56	$.39

Based on $.50 per therm of gas and $.10 per KWH.