

## **Copeland Scroll Digital VRF Air Conditioning Saves Precious Energy for International Copper Office, Mumbai**

### **Results**

- 31% annual KWHr energy saving proved by Energy audit and three year energy bill comparison
- Improved human comfort and working environment
- Intangible benefits like aesthetic & sound performance improvement

### **Technology and services**

- The Digital Scroll VRF Air conditioner was designed, manufactured, installed and commissioned by Blue Star Limited, one of the key OEM partners of Emerson Climate Technologies in India
- Copeland Scroll Digital compressor is used in the VRF AC
- Transition to environment friendly R410A refrigerant from existing R22 AC system

### **Application**

- Replacing seven R22 Split Air conditioners of 1.5TR and 2TR capacity with single 12HP R410A Digital Scroll VRF AC at International Copper office at Mumbai.

### **Customer**

The International Copper Promotion Council (India), (ICPCI), Powai, Mumbai is the Indian centre of the International Copper Association Limited, a leading organization for the promotion of copper world wide.

ICPCI's principal objective is "to promote the beneficial usage of copper for safety, health, environment and energy savings." This is done by implementing programmes and initiating and funding projects in copper technology, research and market development.

### **Challenge**

The seven Split ACs used at ICPCI could not maintain comfort conditions in the office, even though they were under annual maintenance contract with a dealer of a reputed brand. The office staffs were complaining about the poor comfort conditions in the office. The electrical power supply to ICPCI, Powai, Mumbai office is provided by a private electrical company, under LT2 tariff. With escalating electricity tariff charges, the annual spend on AC energy consumption was increasing.

ICPCI discussed the issue with Emerson Climate Technologies and decided to switch over to the latest technology Digital Scroll VRF AC system to improve the office comfort conditions and to reduce the energy bill. ICPCI wanted to verify the energy savings and improvement in comfort conditions and assigned auditing work on comfort improvements and energy savings, pre & post Digital scroll VRF installation to TERI.

## **Solution**

ICPCI got a base line energy audit conducted by TERI in April 2008. The temperature, % RH, power measurements, and the comfort feelings of employees were also recorded.

With the involvement of Blue Star sales team and technical team, a 12HP, R410A, Digital Scroll VRF unit Model BVRF-12TCE was installed and commissioned in May 2008. This 12HP outdoor unit is connected to eight different indoor units of wall mounted & cassettes type units with different cooling capacity.

**The energy saving potential of Digital scroll VRF was proved in the post energy audit** conducted by TERI in August 2009, after successful operation of the AC system for 12 months by ICPCI. Comparison of energy bills paid by ICPCI, Mumbai office over a period of June 2006 (before Digital scroll VRF installation) to May 2009 (one year after installation) proved reduction energy consumption in KWHr by 31% on annual basis and realised energy cost saving of 38%. Difference in percentage savings for energy (KWHr) and cost savings (Rupees) is due to change in tariff From Rs.8.50 to Rs.9.40 per KWHr.

**The comfort conditions inside the office greatly improved to the satisfaction of ICPCI employees**, as the electronic control system of Digital scroll VRF monitors the usage and load conditions of each Indoor unit every few seconds and modulates the capacity output of the outdoor unit over 10% to 100%. It also allows different rooms to be set at different temperatures, as per user requirement, and maintains it within  $\pm 0.5^{\circ}\text{C}$ .

**The Digital scroll VRF AC provides many intangible benefits like improvement in aesthetics, savings in floor space for outdoor unit, low sound performance, flexibility in using different types and capacities of Indoor unit** etc., as experienced by ICPCI.

The Overall the retrofit project experience and benefits are well appreciated and considered as a true value for investment by ICPCI. Mr. Manas Kundu of ICPCI aptly sums this up, "We evaluated different options available to us to improve the employees comfort and to reduce the Air conditioning energy bill. The results over more than a year now have vindicated that our decision to invest in a Digital VRF AC system was the right one, even though the first cost was higher than other options'.

In India, different OEM partners of Emerson Climate Technologies like Blue Star, Samsung, Voltas and York offer Digital VRF AC systems and significantly contribute in saving precious energy and environment by creating hundreds of success stories like the ICPCI, Mumbai site.

	<u>Before modification</u>	<u>After modification</u>
Total AC Capacity	11.5TR	10.0 TR (12HP)
No of Indoor units	7	8
Refrigerant	HCFC22	HFC410A
Type of AC system	Individual Split AC	Multi Indoor Central VRF
Aesthetics	Baseline	Great improvement
Outdoor unit foot print	Baseline	Drastically reduced
Outdoor unit sound	Baseline	Drastically reduced
Temperature control	Set point $\pm 2- 3^{\circ}\text{C}$	Set point $\pm 0.5^{\circ}\text{C}$
Energy saving	Baseline	31% KWHr annually
Inside Comfort	Not Good	Vast improvement



**Table 12** Month-wise electricity consumption for last three years

Sl. No.	Month	Total Consumption, kWh	Month	Total Consumption, kWh	Month	Total Consumption, kWh
1	May - 09	1956	May - 08	1824	May - 07	4811
2	Apr - 09	1864	Apr - 08	2402	Apr - 07	4178
3	Mar - 09	1854	Mar - 08	2201	Mar - 07	4142
4	Feb - 09	1704	Feb - 08	1799	Feb - 07	3406
5	Jan - 09	1745	Jan - 08	1260	Jan - 07	3425
6	Dec - 08	1450	Dec - 07	1814	Dec - 06	3205
7	Nov - 08	1717	Nov - 07	2649	Nov - 06	4108
8	Oct - 08	1659	Oct - 07	3501	Oct - 06	4525
9	Sep - 08	1719	Sep - 07	3368	Sep - 06	3851
10	Aug - 08	1824	Aug - 07	2758	Aug - 06	2513
11	July - 08	1851	July - 07	3699	July - 06	2688
12	Jun - 08	1895	Jun - 07	3811	Jun - 06	4097
	<b>Total</b>	<b>21238</b>		<b>31086</b>		<b>44949</b>

**Table 13** Month-wise Energy bill amount for last three years

Sl.No.	Month	Energy Bill. (Rs)	Month	Energy Bill. (Rs)	Month	Energy Bill. (Rs)
1	May - 09	16291	May - 08	16610	May - 07	45137
2	Apr - 09	15535	Apr - 08	22570	Apr - 07	35883
3	Mar - 09	16211	Mar - 08	20010	Mar - 07	27012
4	Feb - 09	15357	Feb - 08	17090	Feb - 07	23482
5	Jan - 09	15721	Jan - 08	11011	Jan - 07	23633
6	Dec - 08	13102	Dec - 07	16583	Dec - 06	22840
7	Nov - 08	15473	Nov - 07	25106	Nov - 06	29230
8	Oct - 08	13720	Oct - 07	33802	Oct - 06	46497
9	Sep - 08	14344	Sep - 07	32445	Sep - 06	24836
10	Aug - 08	15207	Aug - 07	25553	Aug - 06	15814
11	July - 08	15429	July - 07	34889	July - 06	16994
12	Jun - 08	14770	Jun - 07	36507	Jun - 06	26130
	<b>Total</b>	<b>181,160</b>		<b>292,176</b>		<b>337,488</b>