

Successful Implementation – Energy Conservation Measure

Measure
Optimization of the Operation of the Precision Air Conditioner by replacement of the 3 Row Condenser Coil with 4 Row Condenser Coil at Reliance Infocomm-Gujarat Circle.
Equipment
Precision Air Conditioner (2 TR)
Industry / Sector
Telecommunication
Year of Implementation
2006
Cost Benefit Analysis
<input type="checkbox"/> Type of Measure: Marginal Investment
<input type="checkbox"/> Annual energy Savings: 5112 KWH
<input type="checkbox"/> Actual cost savings: Rs. 55872/PAC (Energy charges : Rs.30672 + Maintenance charges : Rs. 25200) (Gujarat Circle is having : 180 PAC of this Make).
<input type="checkbox"/> Actual investment: Rs. 14500
<input type="checkbox"/> Payback: 3 Months
Implementation Highlights
<ul style="list-style-type: none"> ▪ Implementation of the Measure has resulted in: <ul style="list-style-type: none"> - Low cost Implementation - This measure can be duplicated for the Air conditioning systems, where heat dissipation through condenser coil in ideal condition is very poor. - Tripping of the PAC on high pressure is reduced. - Compressor life will enhance. - For trial basis this scheme is implemented in 5 Nos PAC of different location. Average saving/PAC is quite attractive.

Summary

Replacement of the PAC 3 Row condenser coil with 4 Row condenser coil results in enhanced performance of the PAC:

- Reduction in the compressor loading cycle. Compressor operation reduced almost 15-20%. Hence reduction in the Base Trans- receive station monthly energy Bill.
- Reduction in the Maintenance Cost.
- Reduction in the tripping of the compressor on High Pressure.

Background

- Reliance Infocomm is the Leading Telecom Operator in India. For each Indoor Base Trans-receive station it is required to have precision Air Conditioner to maintain the shelter temperature as per the requirement of electronics equipment's.
- In Gujarat Circle 480 sites were operational during subject period.
- From Monthly Diesel-Power report it was observed that for same electronics loading, consumption of Hiross make PAC was higher compared to the Carrier 2 TR PAC.
- Based on the Diesel-Power analysis, comprehensive comparison done for the two equipments & subsequent trial taken for the different PAC performance parameters.
- From various trials it was derived that the Heat dissipation not done properly by 3 Row condenser coil. Sub sequent 4 Row condenser coil developed & trial taken with the newly developed condenser coil.
- Quite favorable parameters observed like: compressor ON time reduced, Suction-Discharge pressure reduced, Energy consumption reduced, condenser & Evaporator Delta T enhanced. Trail taken at 5 sites. Based on the performance of the 5 sites result, the same is implemented at balance sites one by one.

Principle

- Based on the equation Q (Total Heat Input) = $m \times Cp \times \Delta T$ & A (Area of Heat exchanger) = $Q / (U \times \Delta T)$, Where U = number describing the heat transfer coefficient or degree of influence of materials.

- With the increase in Area of Heat exchanger (Condenser Coil) the efficiency of the PAC improved due to improved heat dissipation through the condenser coil.

- Improved efficiency of the condenser coil reduces the loading time of compressor & tripping the system on High Pressure. This ultimately reflects as reduction in the power consumption of the PAC.

Details of techno-economics:

Particulars	Actual energy savings
Annual Total energy savings, KWH	5112 / PAC
Annual Cost Savings ,Rs.	55872/PAC
Cost of Implementation, Rs.	14500 / PAC
Payback period	3 Months

Implementation issues

Nil

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Condenser Coil Specifications

Sr. No	Parameter	Specification	
		Original Coil	Locally developed
1	Copper Tube	3/8" (0.4 MM)	3/8" (0.4 MM IMPORTED)
2	Fins	Aluminium,12 FPI	Aluminium,13 FPI,(38 G Thickness)
3	End Plate	Aluminium	Aluminium
4	Corrossion Treatment	No	Yes
5	No Of Raws	3	4
6	No of Circuits	4	4
7	Hot Gas connection	5/8" Outdoor Copper	5/8" Outdoor Copper
8	Liquid Line Connection	1/2" Out door Copper	1/2" Out door Copper
9	Face Area (Sq Ft)	5.07	5.08
10	Delta T Across condenser	5.5 Deg. Cent	7 Deg. Cent

Saving projection for Hiross 2 TR PAC with 4 Row condenser Coil

Sr. No	MP Name	Site Name	Facility Type	Projected recurring saving/Annum (Rs.)	Remarks
1	Mehshana	Kalol BTS	With Modcell 3.0,3 Carrier	65,418	
2	Ahmedabad-1	Saraspur BTS	With Modcell 3.0,2 Carrier with Colocated BAN	51,027	
3	Ahmedabad-1	Premdarwaja BTS	With Modcell 3.0,3 Carrier with Colocated BAN	32,486	
4	Ahmedabad-1	Jamlapur BTS	With Modcell 3.0,2 Carrier	26,668	

PERFORMANCE OF THE NEWLY DEVELOPED CONDENSER COIL

Sr. No	Month	Total SEB Energy consumed (kwh)	DG Run Hrs	DG-1 Power gen (KWH)	Total Site Power Consumption	No of Days	Equivalent Monthly consumption	Average Monthly Consumption	Remarks
1	June'05	4926	11	55	4981	30	4981	4586.428763	
2	july'05	5570	37	215	5785	31	5598		
3	Aug'05	4893	5	32	4925	31	4766		
4	Sep'05	4298	3	20	4318	30	4318		
5	Oct'05	4228	14	34	4262	31	4125		
6	Nov'05	4481	20	105	4586	30	4586		
7	Dec'05	3973	14	37	4010	31	3881		
8	Jan'06	3991	10	72	4063	31	3932		
9	Feb'06	4217	14	88	4305	28	4613		
10	March'06	4615	2	14	4629	31	4480		
11	April'06	4997	9	62	5059	30	5059		
12	May'06	4796	12	60	4856	31	4699		
Average consumption with 3 Row Condenser Coil									
13	June'06	3730	21	110	3840	30	3840	3747.741935	Performance with Newly developed 4 Row Condenser coil available with the original PAC unit
14	July'06	3695	40	84	3779	31	3657.096774		
15	August'06	3756	17	115	3871	31	3746.129032		
Average consumption with 4 Row Condenser Coil								3747.741935	
Actual Monthly Savings with Newly developed 4 Row Condenser Coil (In KWH)								839	
Actual Monthly Savings (@ Rs. 6.5/KWH)with Newly developed 4 Row Condenser Coil (In Rs.)								5451	
Projected Yearly Savings with Newly developed 4 Row Condenser Coil (In KWH)								10064	
Projected Yearly Savings (@ Rs. 6.5/KWH) with Newly developed 4 Row Condenser Coil (In Rs.)								65418	

PERFORMANCE OF THE NEWLY DEVELOPED CONDENSER COIL AT SARASPUR BTS

Sr. No	Month	Total SEB Energy consumed (kwh)	DG-1 Run Hrs	DG-1 Power gen (KWH)	Total Site Power Consumption	No of Days	Equivalent Monthly consumption	Average Monthly Consumption	Remarks
1	April'05	3832	7	29	3861	30	3861	3608	Performance With Condenser Coil available with the original PAC unit
2	May'05				0		#DIV/0!		
3	June'05	4089	4	16	4105	30	4105		
4	July'05	4756	1	4	4760	41	3483		
5	Aug'05	3923	5	21	3944	31	3817		
6	Sep'05	3658	1	4	3662	30	3662		
7	Oct'05	3803	3	12	3815	31	3692		
8	Nov'05	3571	1	4	3575	30	3575		
9	Dec'05	3268	1	4	3272	31	3166		
10	Jan'06	3416	2	8	3424	31	3314		
11	Feb'06	3304	1	4	3308	28	3544		
12	March'06	3584	1	4	3588	31	3472		
Average consumption with 3 Row Condenser Coil								3608	
13	April'06	2961	1	4	2965	30	2965	2954	Performance with Newly developed 4 Row Condenser coil available with the original PAC unit
14	May'06	3018	26	101	3119	31	3018.387097		
15	June'06	3071	1	4	3075	30	3075		
16	July'06	2951	2	8	2959	31	2863.548387		
17	August'06	2934	2	8	2942	31	2847.096774		
Average consumption with 4 Row Condenser Coil								2954	
Actual Monthly Savings with Newly developed 4 Row Condenser Coil (In KWH)								654	
Actual Monthly Savings (@ Rs. 6.5/KWH)with Newly developed 4 Row Condenser Coil (In Rs.)								4252	
Projected Yearly Savings with Newly developed 4 Row Condenser Coil (In KWH)								7850	
Projected Yearly Savings (@ Rs. 6.5/KWH) with Newly developed 4 Row Condenser Coil (In Rs.)								51027	

PERFORMANCE OF THE NEWLY DEVELOPED CONDENSER COIL AT PREMDARWAJA BTS

Sr. No	Month	Total SEB Energy consumed (kwh)	DG-1 Run Hrs	DG-1 Power gen (KWH)	Total Site Power Consumption	No of Days	Equivalent Monthly consumption	Average Monthly Consumption	Remarks
1	Aug'05	4827	5	19	4846	31	4689.68	4604	Performance With Condenser Coil available with the original PAC unit
2	Sep'05	4616	1	4	4620	30	4620		
3	Oct'05	4847	3	12	4859	31	4702		
4	Nov'05	4410	1	4	4414	30	4414		
5	Dec'05	4399	0	0	4399	31	4257		
6	Jan'06	4323	0	0	4323	31	4184		
7	Feb'06	4124	12	40	4164	28	4461		
8	March'06	4805	1	4	4809	31	4654		
9	April'06	4947	1	4	4951	30	4951		
10	May'06	5107	1	4	5111	31	4946		
11	June'06	4721	12	43	4764	30	4764		
Average consumption with 3 Row Condenser Coil								4604	
12	July'06	4373	5	20	4393	31	4251	4187	Performance with Newly developed 4 Row Condenser coil available with the original PAC unit
13	August'06	4257	1	4	4261	31	4124		
Average consumption with 4 Row Condenser Coil								4187	
Actual Monthly Savings with Newly developed 4 Row Condenser Coil (In KWH)								416	
Actual Monthly Savings (@ Rs. 6.5/KWH)with Newly developed 4 Row Condenser Coil (In Rs.)								2707	
Projected Yearly Savings with Newly developed 4 Row Condenser Coil (In KWH)								4998	
Projected Yearly Savings (@ Rs. 6.5/KWH) with Newly developed 4 Row Condenser Coil (In Rs.)								32486	

PERFORMANCE OF THE NEWLY DEVELOPED CONDENSER COIL AT Jamalpur BTS

Sr. No	Month	Total SEB Energy consumed (kwh)	DG-1 Run Hrs	DG-1 Power gen (KWH)	Total Site Power Consumption	No of Days	Equivalent Monthly consumption	Average Monthly Consumption	Remarks
1	Aug'05	3620	1	4	3624	31	3507	3515	Performance With Condenser Coil available with the original PAC unit
2	Sep'05	3397	2	9	3406	30	3406		
3	Oct'05	3599	1	4	3603	31	3487		
4	Nov'05	3305	4	16	3321	30	3321		
5	Dec'05	3440	1	4	3444	31	3333		
6	Jan'06	3273	4	16	3289	31	3183		
7	Feb'06	3276	1	4	3280	28	3514		
8	March'06	3745	1	4	3749	31	3628		
9	April'06	3731	2	8	3739	30	3739		
10	May'06	3845	2	8	3853	31	3729		
11	June'06	3810	1	4	3814	30	3814		
Average consumption with 3 Row Condenser Coil									
13	July'06	3324	1	4	3328	30	3328	3173	Performance with Newly developed 4 Row Condenser coilCondenser Coil available with the original PAC unit
14	August'06	3110	2	8	3118	31	3017.419355		
Average consumption with 4 Row Condenser Coil								3173	
Actual Monthly Savings with Newly developed 4 Row Condenser Coil (In KWH)								342	
Actual Monthly Savings (@ Rs. 6.5/KWH)with Newly developed 4 Row Condenser Coil (In Rs.)								2222	
Projected Yearly Savings with Newly developed 4 Row Condenser Coil (In KWH)								4103	
Projected Yearly Savings (@ Rs. 6.5/KWH) with Newly developed 4 Row Condenser Coil (In Rs.)								26668	