Site: Korangi

Location: Pakistan

Sector: Pharmaceuticals

Project Type: Kaizen Light

Date: Oct 2019

MD

HVAC PROJECTS

Re-direct wasted exhaust air to fresh air units

- Many exhaust fans running at fixed speed – mainly to provide pressure balance
- Conditioned, filtered, dry exhaust air wasted to outside
- Carry out design and risk assessment area-by-area to establish any cross contamination or health and safety risks. Different areas will have different solutions.
- Redirect ducts to FAHU unit – reducing dehumidification load
  - Ducts to connect after cooling coil, before fan if possible

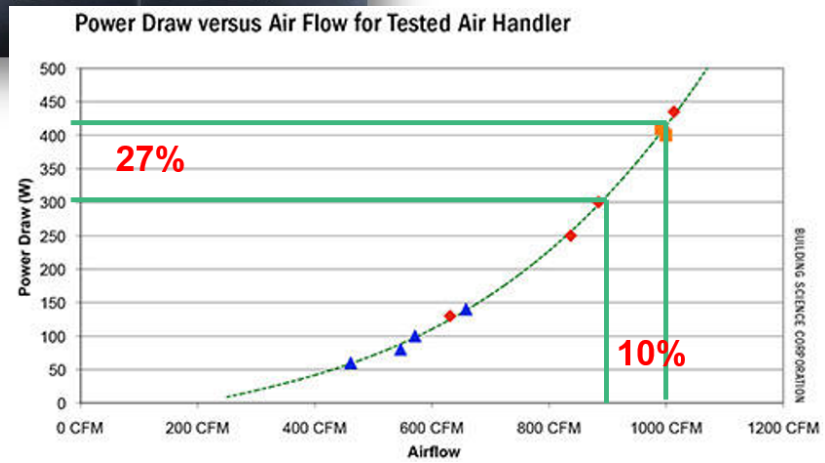
Project	TOTAL Capital Cost (PKR)	Total cost (PKR)	Electrical Savings (kWh)	Natural Gas Savings (kWh)	Total Savings (kWh)	% Base load (kWh)	Total Saving (CO2)	Total Cost Saving (PKR)	Payback (years)
Lactam redirect exhaust to FA units	4,350,000	4,350,000	-	346,106	346,106	1.41%	64	1,418,064	3.07
Lactam sterile redirect exhaust to FA units	20,400,000	20,400,000	-	866,922	866,922	3.52%	160	3,551,948	5.74
Non-Lactam sterile redirect exhaust to FA units	7,050,000	7,050,000	-	771,166	771,166	3.13%	142	3,159,620	2.23
Non-Lactam tablets redirect exhaust to FA units	2,850,000	2,850,000	-	342,103	342,103	1.39%	63	1,401,661	2.03

MH

HVAC PROJECTS

Air change rate reduction & Pressurisation review

- Many units operate at low ACPH, however there is still opportunity for reduction
- All environmental conditions and particulate limits will be maintained
- Structured approach to delivery of ACPH reduction – full risk assessment and change control. Trial area first.
- Full HVAC rebalance can also optimise pressurisation regime – aim to eliminate or reduce exhaust fan energy



Project	TOTAL Capital Cost (PKR)	Total cost (PKR)	Electrical Savings (kWh)	Natural Gas Savings (kWh)	Total Savings (kWh)	% Base load (kWh)	Total Saving (CO2)	Total Cost Saving (PKR)	Payback (years)
Lactam ACH rate & pressurisation rebalance	9,525,000	9,525,000	63,905	73,504	137,409	0.56%	47	1,438,174	6.62
Lactam sterile ACH rate & pressurisation rebalance	5,400,000	5,400,000	81,521	44,768	126,289	0.51%	51	1,633,875	3.31
Non-Lactam Sterile ACH rate & pressurisation rebalance	8,700,000	8,700,000	123,614	52,407	176,021	0.72%	75	2,414,104	3.60
Non-Lactam Tablets ACH rate & pressurisation rebalance	4,575,000	4,575,000	77,083	14,160	91,244	0.37%	43	1,429,510	3.20

MD

HVAC PROJECTS

Desiccant dehumidifier bypass and/or regeneration air heat recovery

- During winter periods – desiccant dehumidifiers may not be needed to reach required room conditions
- Potential for Munter bypass duct with automatic controls
- AND / OR
- Regeneration air for desiccant is very hot and may reach up to 100°C
- Retrofit heat recovery either internal (Munter supply) or external (cross flow plate heat exchanger)
- Needs initial design assessment to quantify savings in detail

Project	TOTAL Capital Cost (PKR)	Total cost (PKR)	Electrical Savings (kWh)	Natural Gas Savings (kWh)	Total Savings (kWh)	% Base load (kWh)	Total Saving (CO2)	Total Cost Saving (PKR)	Payback (years)
Bypass dessicant dehumidifiers - Lactam	5,400,000	5,400,000	13,622	37,592	51,214	0.21%	14	396,381	13.62

SUMMARY

JB

SUMMARY

Project	TOTAL Capital Cost	Total Identified Savings (kWh)	Total Identified Saving (CO2)	Total Cost Saving (€)	Payback (years)
30 Projects	756,861	2,972,495	328	180,713	4.2
%		18%	19%	23%	

- HVAC – main opportunity is to reduce fresh air use, followed by ACH reduction

JB

ENERGY SAVINGS BY TYPE (PKR)

	Savings		
Area	Total kWh	Saving €	t.CO2
Chilled Water Optimisation	672,500	€ 52,500	35
Hot Water Optimisation	809,100	$ 32,600	145
Compressed Air Optimisation	31,200	$ 2,400	2
SWEEP Switch off	45,000	$ 3,500	2
Metering & Monitoring	162,300	$ 10,100	17
HVAC & BMS Optimisation	1,252,400	$ 79,600	127
Total	**2,972,500**	**$ 180,700**	**328**
% of Site	**18%**	**23%**	**19%**

Note: Initial opportunity assessment values for cost, energy & CO_2 savings provide a typical tolerance of +/-30%. Detailed engineering and economic feasibility study may be needed to improve accuracy for capex investment.

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