

Successful Implementation – Energy Conservation Measure

Measure	
Installation of air chiller and vaporizer	
Equipment	
Product cooler	
Industry / Sector	
Complex Fertilizer	
Year of Implementation	
2003-2005	
Cost Benefit Analysis	
□ Type of Measure	: Long term
□ Annual energy Savings	: 2142.4 MW
□ Actual cost savings	: Rs. 74.98 Lakhs / Year
□ Actual investment	: Rs. 161 Lakhs
□ Payback	: 2 years
Implementation Highlights	
<ul style="list-style-type: none"> ▪ Installation of 4 nos. of air chiller and vaporizers ▪ In house engineering calculation. ▪ Provision of F.D. fan for taking care of line pressure drop. ▪ Provision of air filters for protecting air chillers from dust. ▪ Installation of all chillers were completed in two years period. ▪ Higher production rate possible. 	

Summary

For DAP production, ammonia is mixed with phosphoric acid in the pre neutralizer. Since phosphoric acid produced is of 28 % strength, steam is required to concentrate the weak acid of 28 % strength to 54 % strength. Also product cooling requires low air temperature at higher plant load. Since the waste steam generated was not sufficient to meet the power and process requirement, a necessity was felt to install air chiller and vaporizer in DAP Plants.

The above requirements were matched in the ammonia chiller giving dual benefit. Apprx. 72000 Nm³ product cooler is cooled from atmospheric to 13 oC in the air chiller and also liquid ammonia is heated by the heat of air. In this process 1.476×10^6 kCal/Hr enthalpy was picked by ammonia. Thus heat gained by ammonia could compensate for 25.83 MT weak acid per day. This releases steam equivalent to power generation of 6.59 MW per day for 21 hours operation a day.

Background

DAP production facility was facing the limitations of weak acid consumption and product cooling. The higher production rate was limited due to above limitations. The innovative idea was implemented to use the heat of air for heating the ammonia and there by increasing the weak phosphoric acid consumption and also to make available the low temperature air for product cooling at higher plant load.

Principle

To use the latent heat of moisture in air.

Details of techno-economics:

Particulars	Actual energy savings
Nos. of air chiller	4
Air flow through each chiller Nm ³ /Hr	72000
Air chilling temperature	13 oC
Energy exchanged with ammonia	30.996 x 10⁶ kCal/day
Saving of steam by consuming weak acid	56.83 MT/day
Equivalent power generation	6.59 MW per day
Energy saving per year (Based on running Hours)	2142.4 MWH
Cost of energy saved	Rs. 74.98 Lakhs/Annum
Cost of implementation, Rs. lakh	Rs. 161 Lakhs
Simple payback period, Year	2

Implementation issues

2 year time was taken to install all four air chillers.

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