



UREA FERTILIZER FACTORY LIMITED

Cooling Water Conservation through Reduced Water Drainage, Blow Down and Evaporation

SUMMARY OF THE OPTION

Urea Fertilizer Factory Ltd (UFFL) is a government owned producer of ammonia and urea fertilizer in Bangladesh with an installed production capacity of 470,000 tons per year.

The plant has two very large capacity cooling towers that use 16 fans to reduce the temperature of used cooling water so it can be reused in the plant. It was observed that large quantities of water are lost through drainage of blow down and evaporation.

The Team suggested a range of options to reduce water losses and improve fan efficiency. Options that were proposed but not implemented included installation of a float operated switch for the lifting pump, a thermostatic controller for the cooling tower operation, and a variable speed drive for the fans. Proposed options that were implemented were cleaning the heat exchangers, coolers and condenser. Water and electricity was saved but could not be quantified. If all options were implemented the company would save US\$ 140,000 against an investment of US\$ 91,667 and a payback period of 8 months. Potential electricity savings are 1030 MW and 556 tCO₂. For these options to be implemented fully clearance from the Ministry of Industries, the owner public sector corporation, and BCIC is required, which takes time.

KEY WORDS

Chemicals, Bangladesh, Cooling towers, Fertilizer, blow down

OBSERVATIONS

The following observations were made:

- External water is used to cool different equipment in the Ammonia section in addition to the installed cooling circuit designed for total recirculation. The external cooling water is not recovered or recirculated.
- Cooling towers are continuously running irrespective of ambient condition and or production requirement
- A total of 630 m³/hour water is supplied to the cooling towers as make up water. Of this amount, 265 m³ water from blowdown per hour is drained from the cooling towers of the ammonia and urea plants and 250 m³ of water per hour is lost through evaporation
- 16 fans are running for lowering the temperature in the old and new tower. The old cooling tower has 14 fans (10 x 75 kW + 4 x 120 kW = 1230 kW) and new one has 2 fans (2 X 132 kW = 264 kW)
- Measurement indicates that pumps are not fully loaded and motors have a very poor power factor
- There is no automatic control of the number of pumps and fans needed to meet demand
- The measured inlet temperature of the cooling tower in January 2005 was 32-33⁰C, in August 37.5-40⁰C and outlet temperatures were 24-25⁰C and 31-33.9⁰C respectively. The desired inlet temperature is 43⁰C and outlet temperature is 33⁰C.
- Quality of water blowdown from the cooling tower was measured on several dates as follows:



Date	P ^H	NH ₄ ⁺
01.12.2003	8.7	154
15.12.2003	8.6	498
31.12.2003	10.0	503
03.05.2005	8.4	298
31.05.2005	10.1	432

OPTIONS

The Team suggested the following options:

- Install a float operating switch for the lifting pump
- Install a thermostatic controller for cooling tower operation
- Install variable speed drive for the cooling water fan
- De-scale various heat exchangers
- Clean the coolers and condensers
- **Optimizing cooling water quality to reduce the fouling and scale formation in heat exchanger. If the water quality is bad and proper chemical dosing is not being done, it would be difficult to reduce blow down. Normally for cooling water the cycle of concentration is maintained 4-5 (depends upon water quality).**
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These options would reduce water waste through blow down, drained water and evaporated water and reduce the electricity for fan operation.

Plant management decided to only implement the last two suggested options, citing the following two reasons for not implementing additional options:

- Being a government-owned company, it requires long and time consuming bureaucratic steps to obtain permission for the investment in high-cost equipment
- UFFL is one of the key plants in Bangladesh that supplies fertilizer requirement to the agricultural sector. Production disruption may create major impact on the food supply for the population. As such, it also requires major policy decision from the top management of the government to make changes to existing processes

RESULTS

By implementing this option fully, the plant would be able to optimize water draining, blow down and evaporated water. The financial and environmental benefits to be achieved would be as follows, if implemented fully:

Financial benefits (expected)

- Investment: US\$ 91,667 (Tk 5.5 million)
- Annual cost savings: US\$ 140,000 (Tk 8.4 million)
- Payback period: 8 months

Environmental benefits

- Annual electricity savings: 1030 MWh
- Annual GHG emission reduction: 556 tCO₂

The savings from the partially implemented good housekeeping option could not be determined separately.





FOR MORE INFORMATION

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