15 Ways to Improve Cooling Efficiency
When using Airmoving Devices

COOLING TECHNOLOGIES GROUP OF
NMB TECHNOLOGIES CORPORATION

USA Headquarters – Chatsworth, CA
Fan Manufacturing – Shanghai, China

Dr. Yousef Jarrah
#1: Use the Largest and thickest fan possible

The larger the fan size the higher the efficiency and the lower the noise.

small fan efficiency = 10%
large fan efficiency = 30%
#2: Use thermal data to control fan speed

Size the fan for the worst case cooling condition, but operate the fan for the optimum cooling required.

Example: A 19” rack mount system uses four 2415KL (70mm x 70mm x 38mm) fans

- Nominal airflow required: 40 CFM
- Maximum airflow required: 60 CFM (failure mode or high temp operation)

Power required at max airflow: 16.6 Watts
Power required at nominal airflow: 4.9 Watts
One year operating costs for 4 fans at max airflow: $58.17
Power required at nominal airflow: $17.17

Difference: $41 per year*

* Assumes $0.10 per KW/hour charge (Phoenix prices) – 24 hr operation – 7 days a week
#3: Allow for sufficient Air plenum

Minimize downstream blockage

Exhaust

Inlet
#4: Minimize the turns the airflow needs to take to cool the system
#5: Pick the correct type of rotating turbomachine
#6: Operate the axial fan at the peak efficiency point
#7: Operate motorized impellers at the peak efficiency point
#8: Use Inlet Rings for motorized impeller solutions

#9: Minimize the gap between the inlet ring and the motorized impeller

… This is effective for axial fans too!
#10: Use scrolls for motorized impeller solutions where the air is exhausting out in one direction
#11: Minimize obstructions on the inlet/exhaust of the fan.

Fan Tray Design Example

Without finger guard, efficiency improves x%!
#12: Minimize ‘dead air’ spots in the system
#13: Size the inlets and outputs appropriately

This eliminates circulating airflow

Air recirculation will hurt Performance.

Much better.
#14: Ask for an impeller blade customized for the system impedance point for maximum efficiency
15: Ask airmover vendors for higher efficiency motor designs

(And be prepared to pay a little more in up front costs)

Typical motor efficiency of standard fan motors: 60%

• Stronger magnet material
• Three phase driver designs
• Optimized stator design

Motor efficiency can reach: 85%
SUMMARY

#1: Use the largest and thickest fan possible
#2: Use thermal data to control fan speed
#3: Allow for sufficient air plenum
#4: Minimize the turns the airflow needs to take to cool the system
#5: Pick the correct fan for the direction of airflow needed
#6: Operate the axial fan at the peak efficiency point
#7: Operate the motorized impellers at the peak efficiency point
#8: Use inlet rings for motorized impeller cooling applications
#9: Minimize the gap between the inlet ring and the impeller
#10: Use scrolls for motorized impeller solutions where the air is exhausting in one direction
#11: Minimize or eliminate finger guards and other obstructions
#12: Eliminate ‘Dead air’ spots in the system
#13: Size the inlets and outlets appropriately
#14: Ask for an impeller blade customized for the system operating impedance point
#15: Ask airmover vendors for higher efficiency motor designs in their airmoving solutions (and be prepared to pay a bit more up front)
THANK YOU!

NMB
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