Performance problem analysis

Many ACC's have performance problems
Especially in summer.
Not all operators have enough knowledge of the process,
To analyse the system

ACC Team Audits

ACC Team is executing frequent audits to pinpoint source(s)
of lack of performance.
However, our resources are limited.
Therefore, we will organize courses for ACC users

Which system can have an impact on the performance

- Fans in respect of air-flow and static pressure
- Recirculation of hot air
- Fouling
- Steam distribution in heat exchangers
- Leaks
- Noise, indirectly

Fans

Most fans are installed based on the fan design

The parameters are: Speed, blade angle and type of fan

The type of fan can influence the performance.

Some shapes are limited in the air-flow

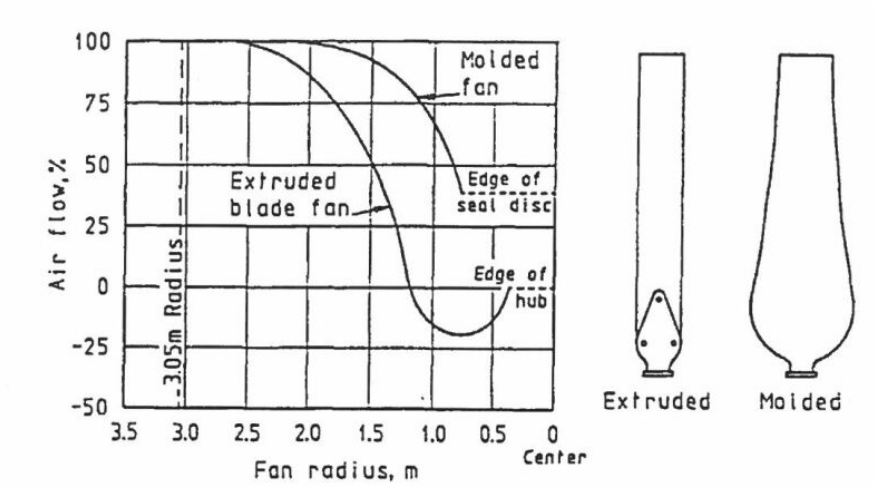


Figure 6.0.2: Air-flow distribution through fan.

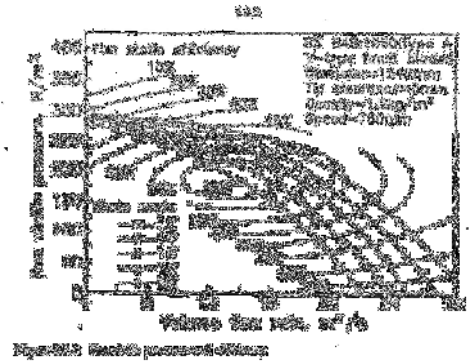
Impact of static pressure

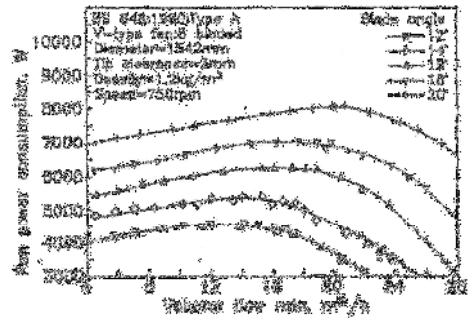
Static pressure does influence the air flow

More static pressure the less air flow

Example: static pressure from 100 to 200 Pa results in an air flow From 20 to 14 m3/s (30% less)

Parallel to this, the motor power required Must be available.





Fan measurements

Three parameters should be measured

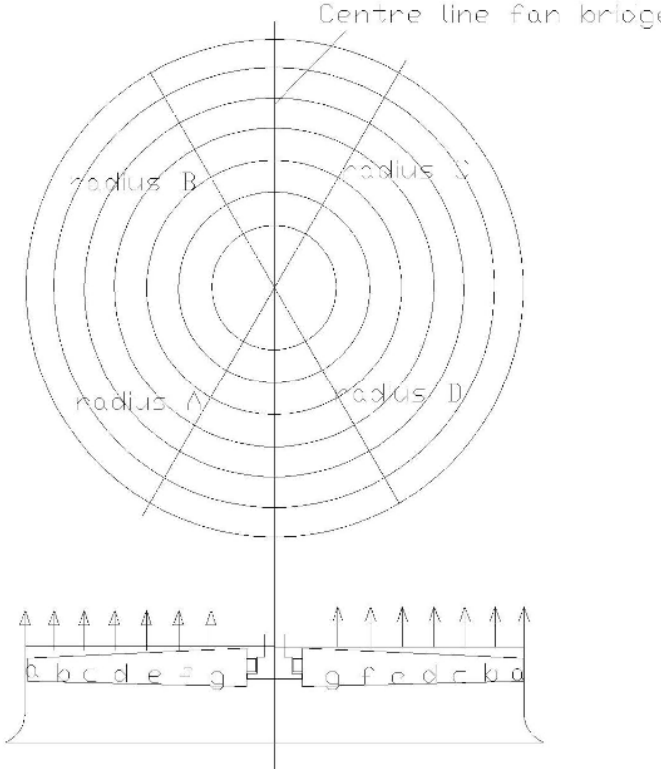
1. Air flow. Done with a flow meter in a pattern indicated by ASME

This is done in at least four directions

2. Static pressure in plenum. This is the delta pressure between the ambient and the plenum. Be sure you have enough measurement as the turbulence can result in unreliable values.

3. Absorbed power. This should be done on the motor terminals or MCC

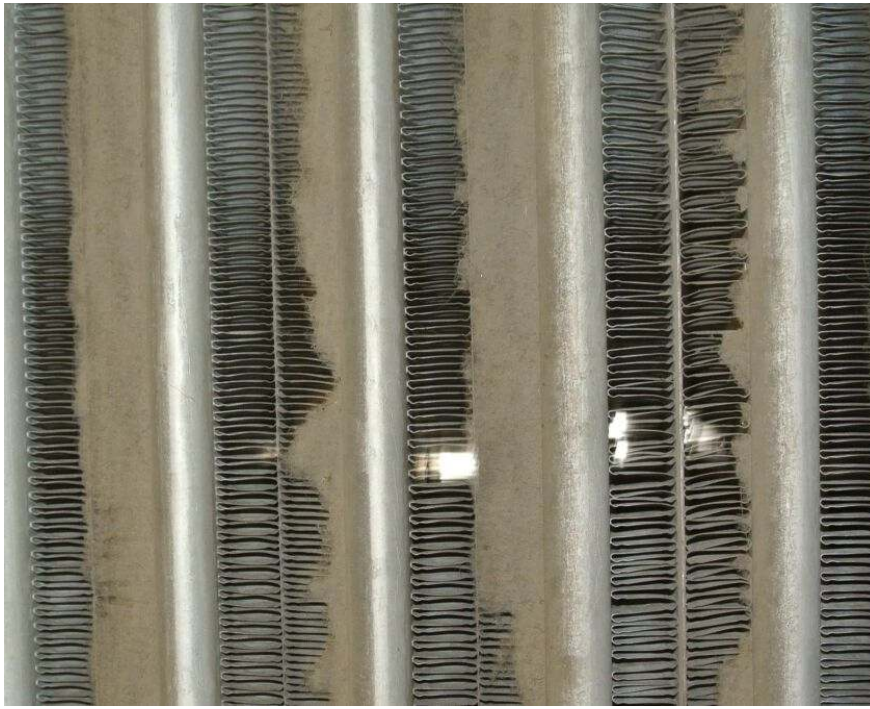
With this data the fan selection can be checked.



Recirculation

Recirculation means hot air from the top is sucked down
to the inlet of the fans, resulting in warmer air for cooling.
The main cause for this is the difference in
suction pressure at the fan inlet and the pressure at the outlet of the ACC
This can be caused by a nearby building
and wind
Finding this is, to measure the air temperature in the plenum
and the air temperature at distance.

Fouling



Fouling is an important parameter, impacting the performance.

Fouling from dust, seeds and insects, can obstruct the space between the fins, resulting in higher static pressure and less air flow.

Fouling should be removed with high pressure washing (90 – 110 bar)

Most fouling is loose and covers the inside of the bundles, this is relative easy to remove.

There can be also permanent fouling. This material that sticks on the aluminum fin-surface and will make a bond with the aluminum due to the warm surface.

This fouling cannot be removed with High pressure wash.

This should be done with blasting with sodium bi-carbonate

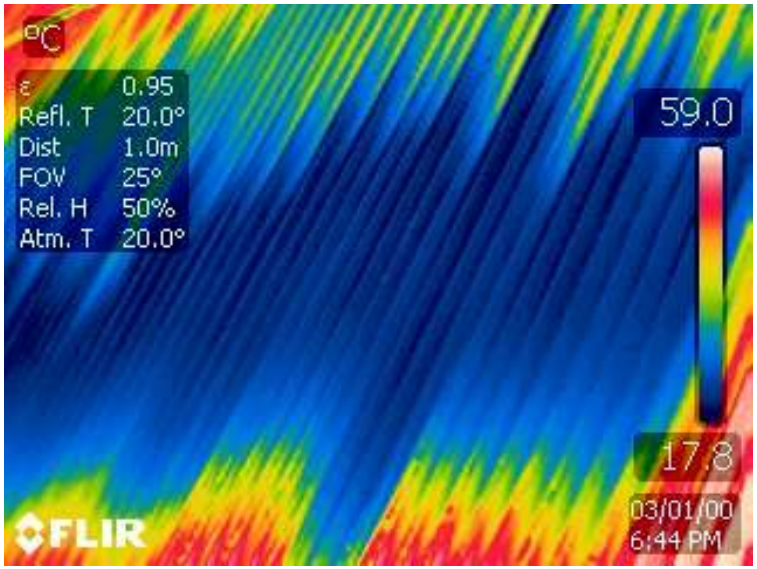
Thermal images of heat exchangers

The steam flow through the heat exchangers of an ACC is controlled by pressure difference between inlet and outlet.

This pressure difference is small, about 15 mbar.

If the steam flow is obstructed by fouling or steam flow problems, cold spots can be present reducing the performance.

This can be caused by the vacuum pumps or the layout of the suction piping.



Leaks in the vacuum section

An ACC is a vacuum steam condenser.
The ACC is filled
with steam after extraction all the air.
If there is a leak air can penetrade the
System, blanketing the inside of the finned
tubes and
reducing the heat transfer.
A simple vacuum drop test can indicate the
leak rate.
A good ACC will have a leak rate increasing the
internal pressure with 0.5 to 1 mbar / minute.
If leaks have been indicated, the difficult process of
finding the leak must be done. The most common and reliable way to find leaks is to spray helium gas near a suspect location. Real time the extraction will be analyzed on presence of helium. If helium is detected
the location where helium was sprayed has is a leak.

Noise

Noise is not directly related to performance problems.

however some operators reduce the speed of the fan when noise is an issue.

If the fan is suitable this can be done but the blade angle has to be increased to compensate for the loss of air-flow.

This needs a separate selection as with low speeds the fan can go into stall, reducing the air-flow considerably

Thank you for your attention

If you even feel that you operators should follow a course concerning fault analysis and or thermal design analysis,

You can contact ACC Team, mail huubh@acc-team.com

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