



# SKOV International

**PIG EDITION**

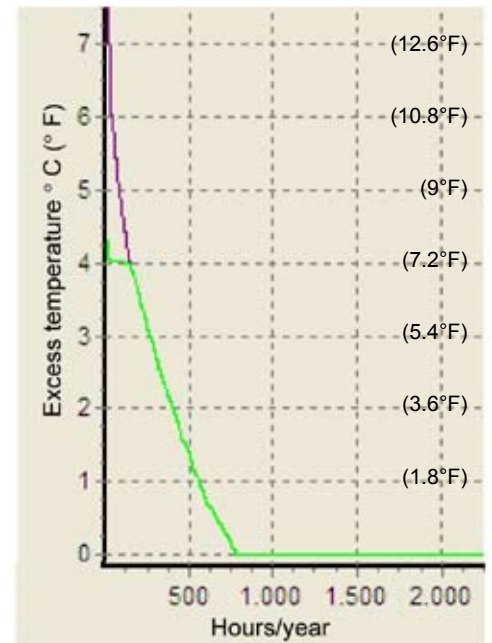
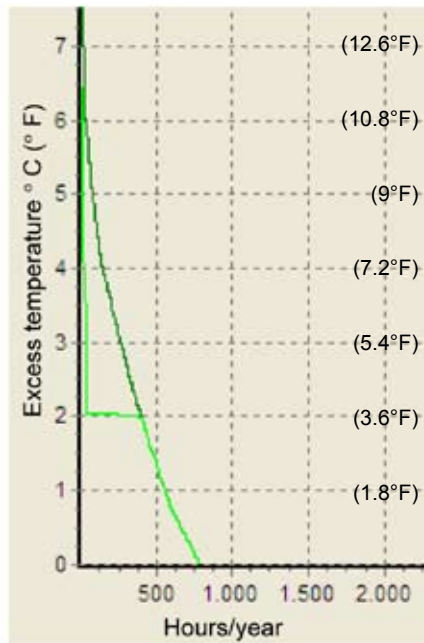
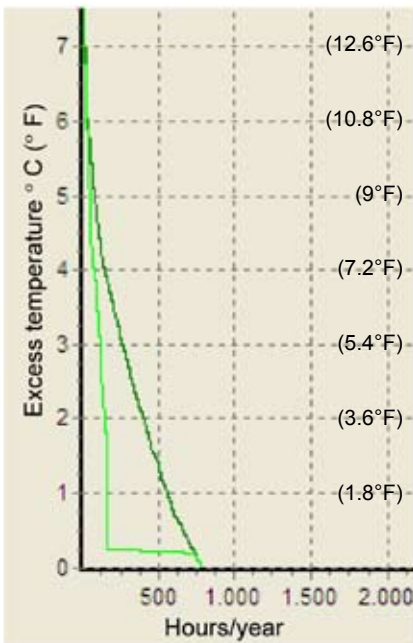
May 2008

## The effect of high-pressure cooling in pig houses - theoretical analysis

SKOV has made a number of calculations in StaldVent in order to exemplify some important conditions concerning high-pressure cooling; in particular choice of temperature for starting the cooling system and the importance of temperature strategy.

The calculations are made on the basis of a Danish finisher section of 400 pigs and with 22-17° C (72-63° F) as the primary temperature strategy. The high-pressure cooling is assumed to be inactive when the humidity inside the pig house exceeds 85%.





**Figure 1: Cooling set point +0.3° C (+0.54° F). Figure 2: Cooling set point +2° C (+3.6° F). Figure 3: Cooling set point +4° C (+7.2° F).**

In the duration diagrams in Figure 1-3, you see a comparison of excess temperatures in the two simulations, with and without cooling respectively after one year of operation. If the house temperature is 19° C (66° F) when 18° C (64° F) is required, there is an excess temperature of 1° C (2° F). In the simulations, the cooling is assumed active at an excess temperature of 0.3° C (0.54° F), 2° C (3.6° F) and 4° C (7.2° F). At these excess temperatures, it is possible to have 100% cooling unlike in practise where the p-band is typically 2° C (3.6° F).

The light green and lower curve of the figures symbolizes the temperature inside the pig house if cooling is installed. The upper curve symbolizes the temperature, if cooling is not installed.

Based on the above graphs, it can be concluded:

- The house temperature is higher than required approx. 800 hours/year if cooling is not installed. (Fig. 1-3). The number of °C hours\* with excess temperature is approx. 2000° Ch (3600° Fh).
- With cooling, it is theoretically possible to reduce this to approx. 150 hours/year and 500° C hours (900° F hours). (Fig. 1)
- If the cooling - for practical reasons or due to the automatic control - is not activated until the excess temperature is 2° C (3.6° F), approx. 1200° C hours (2160° F hours) with excess temperature are expected. (Fig. 2)
- If the cooling is not activated until the excess temperature is 4° C (7.2° F), approx. 1900° C hours (3420° F hours) with excess temperature are expected. (Fig. 3)

\* °C hours: °C hour (°F hours) reflects a too high temperature over a period of time. One hour with 2° C (3.6° F) excess temperature results in two °C hours (3.6° F hours), two hours with 3° C (5.4° F) result in six °C hours (10.8° F hours) etc.

	Temperature strategy	Cooling set point	Oper. hours cooling/year	Hours with excess temp./year	C hours with excess temp./year
Without cooling	22-17° C	+0.3° C	0 h per year	800 h per year	2000° Ch per year
	72-63° F	+0.54° F			3600° Fh per year
With cooling	22-17° C	+0.3° C	800 h per year	150 h per year	500° Ch per year
	72-63° F	+0.54° F			900° Fh per year
With cooling	22-17° C	+2° C	400 h per year	800 h per year	1200° Ch per year
	72-63° F	+3.6° F			2160° Fh per year
With cooling	22-17° C	+4° C	200 h per year	800 h per year	1900° Ch per year
	72-63° F	+7.2° F			3420° Fh per year
Without cooling	18-15° C	+0.3° C	0 h per year	2000 h per year	5600° Ch per year
	65-59° F	+0.54° F			10.080° Fh per year
With cooling	18-15° C	+0.3° C	2000 h per year	700 h per year	3200° Ch per year
	65-59° F	+0.54° F			5760° Fh per year

In Table 1 - where a 18-15° C (65-59° F) temperature strategy is also included - the analytical findings are summarized.

Table 1: The analytical findings concerning the start strategy for high-pressure cooling and the temperature strategy in the pig house.

### Conclusion:

It is essential for the effect of the high-pressure cooling that a sensible start strategy be chosen. If the high-pressure cooling is activated "too late", the positive effect of the cooling will thus be very limited.

In practice, the risk of the system switching between active/not active, water waste on the floor etc. should however also be taken into account.

The temperature strategy has major impact on the effect of the high-pressure cooling. The lower the temperature strategy, the more hours you have a beneficial effect of the high-pressure cooling.