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LOCHINVAR presentation

Presentation by LOCHINVAR for the commercial and industrial fans and blowers workshop in regards to the proposed regulation

Additional submitted attachment is included below.

LOCHINVAR
CEC Proposed Fan Rule
Public Meeting

July 11, 2018

Lochinvar

Lochinvar, LLC is a leading manufacturer of residential and commercial high efficiency boilers, water heaters and pool heaters. Lochinvar has been in the business of manufacturing water heaters and related products since 1939 and is a wholly owned subsidiary of the A. O. Smith Corporation.

The Request

We request and recommend that imbedded fans used to provide air for combustion be excluded from the CEC Fan Rule to prevent increased energy consumption and other adverse effects.

Includes gas and oil fired:

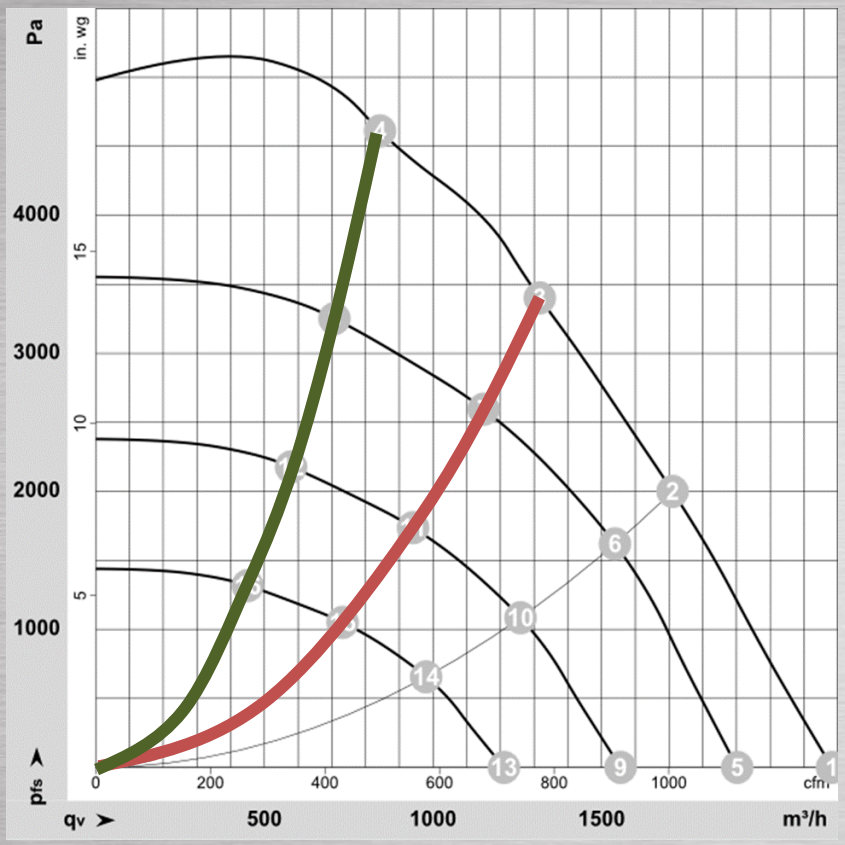
- Boilers
- Pool Heaters
- Water Heaters

Fans in Combustion Appliances

Efficient combustion of fuels requires precise control of air and fuel ratios. Fans are essential parts of combustion systems.

Modern, high efficiency combustion systems use (almost exclusively) fans with highly efficient ECM motors which allow reliable speed control.

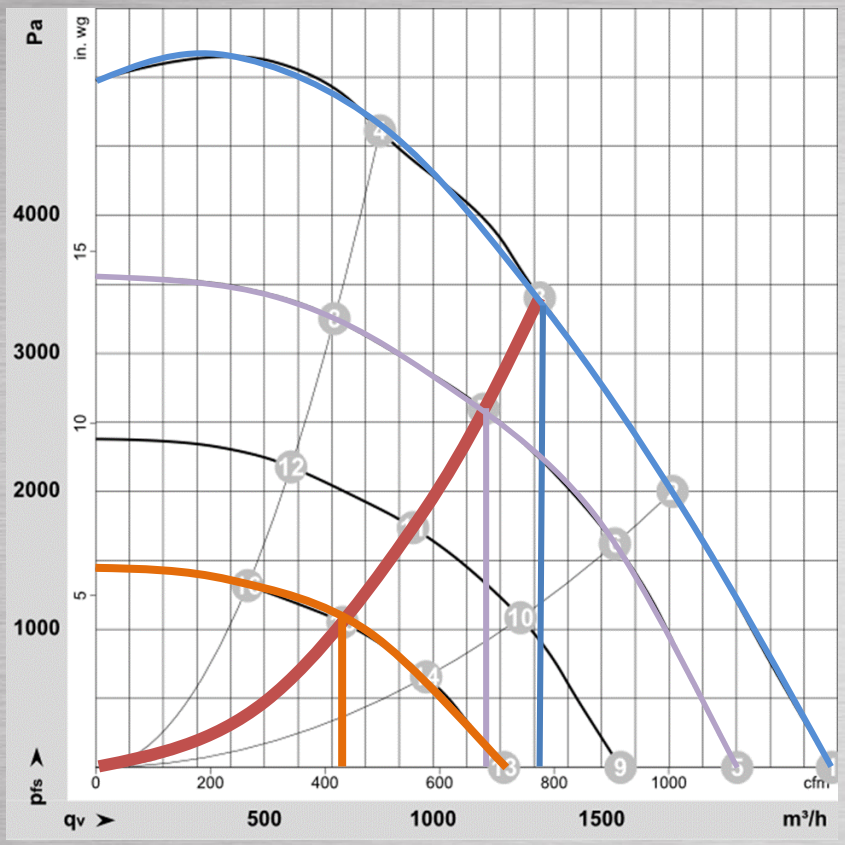
Product Curves



The burner, heat exchanger and ducting create resistance to the air flow.

Higher efficiency heat exchangers will restrict the air flow more than low efficiency designs.

Air Flow

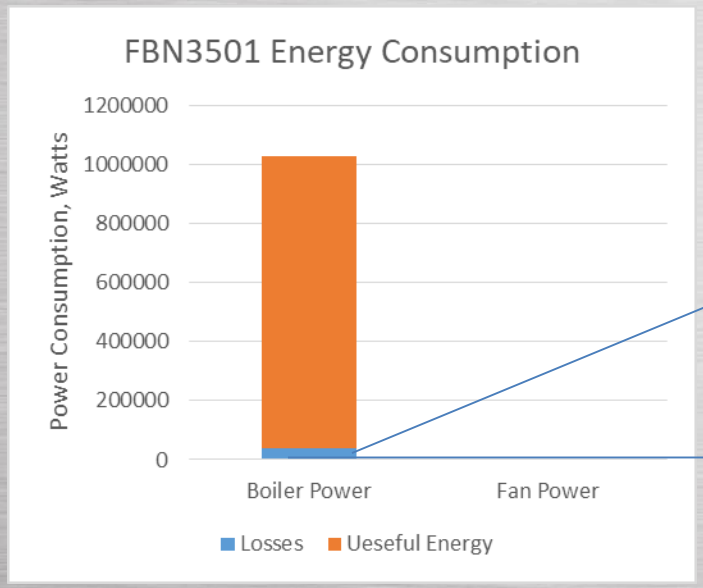


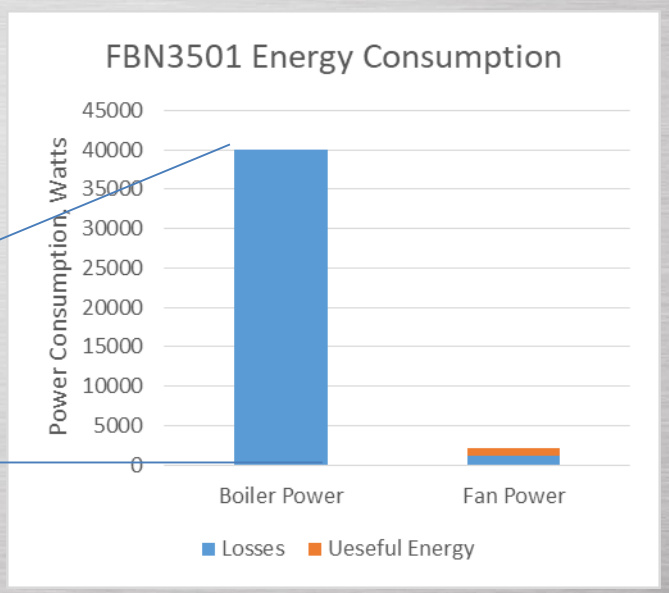
The point where the fan curve intersects the resistance curve for the combustion appliance determines the air flow rate.

Fan RPM is adjusted to modulate the air flow, changing the firing rate.

Energy Savings or Expense?

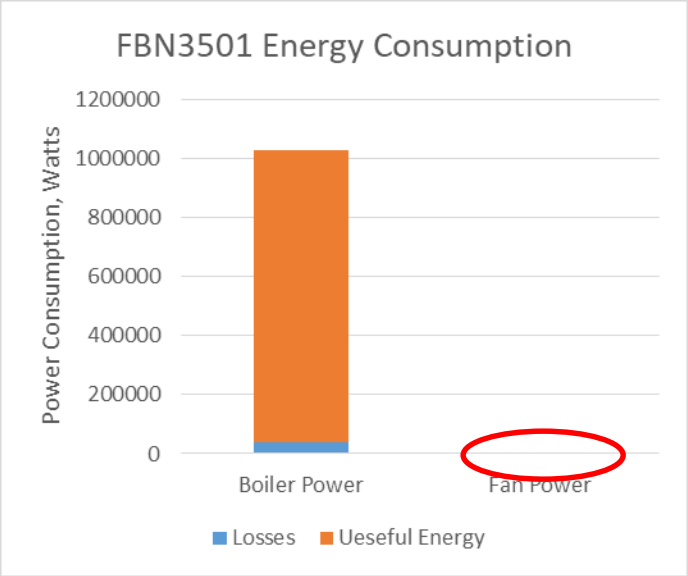
The vast majority of energy consumed by combustion systems is in the fuel burned. The energy consumption from fans is about 0.2% of the total energy consumption.





Energy Savings or Expense?

Since it is unlikely that the rule will improve fan energy consumption by more than 50% in combustion appliances, that means the energy savings will be less than 0.1% of the thermal efficiency.



Any loss of thermal efficiency caused by the fan rule would have to be less than 0.1% or the rule would cost energy rather than save energy.

How the Fan Rule Affects Products

By limiting the allowable use of combustion fans to the highest efficiency window, some high efficiency designs will be excluded or made less efficient.

- Highly restrictive air passages (ARMOR)
- High turndown stages (CREST)

Note: The examples provided are Lochinvar products, but the design considerations apply to many other products and manufacturers.

The Examples

ARMOR® CONDENSING WATER HEATER

A BUILT-IN

U/HR

EET

CREST® CONDENSING BOILER

SMART TOUCH™

CON·X·US® REMOTE CONNECT

MODBUS AND BACnet MSTP PROTOCOL

CASCADING SEQUENCER WITH CASCADE REDUNDANCY

6 INPUTS FROM 750,000 TO 2.0 MILLION BTU/HR

UP TO 25:1 TURNDOWN RATIO

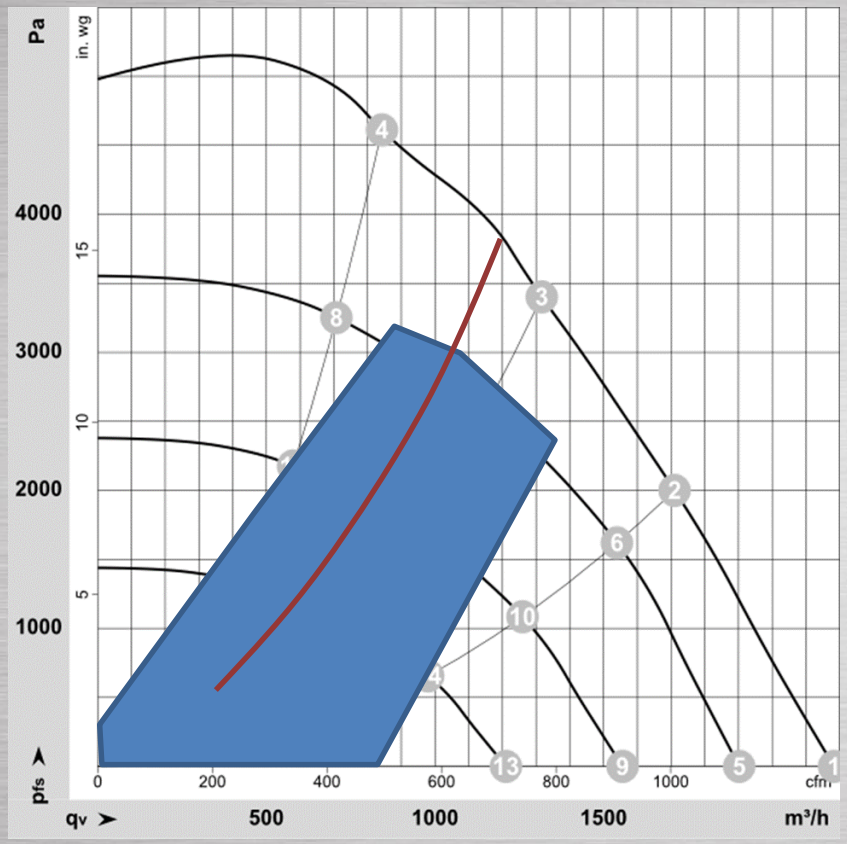
DIRECT-VENTING UP TO 100 FEET USING PVC, CPVC, POLYPROPYLENE OR STAINLESS STEEL

FLEXIBLE FLOW RATES UP TO 350 GPM

FRONT END LOADING CAPABILITY

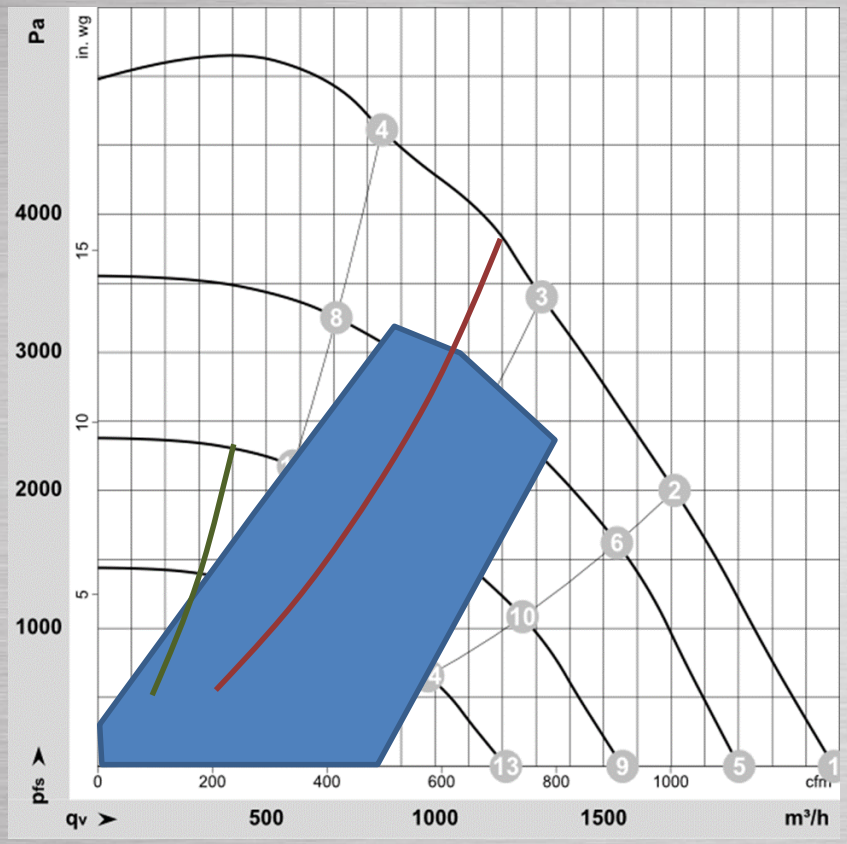
Lochinvar®
HIGH EFFICIENCY BOILERS & WATER HEATERS

Loss of Turndown



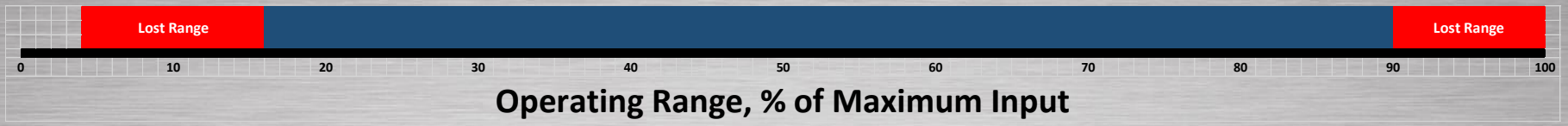
The peak efficiency for fans often stops before the maximum RPM is reached. Many combustion systems use the full range of RPMs to maximize modulation (turndown ratio).

Loss of Turndown



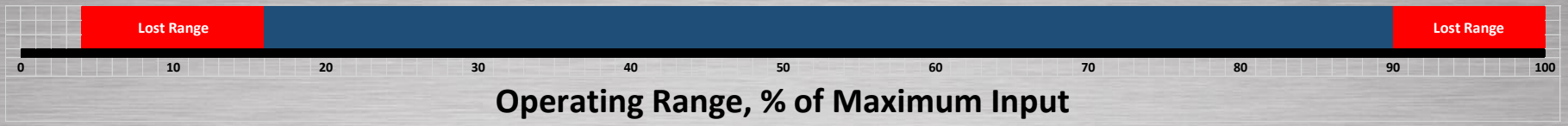
In the CREST boiler we get additional turndown by using an air shutter to restrict air flow and provide a second, low air flow, operating range.

Loss of Turndown



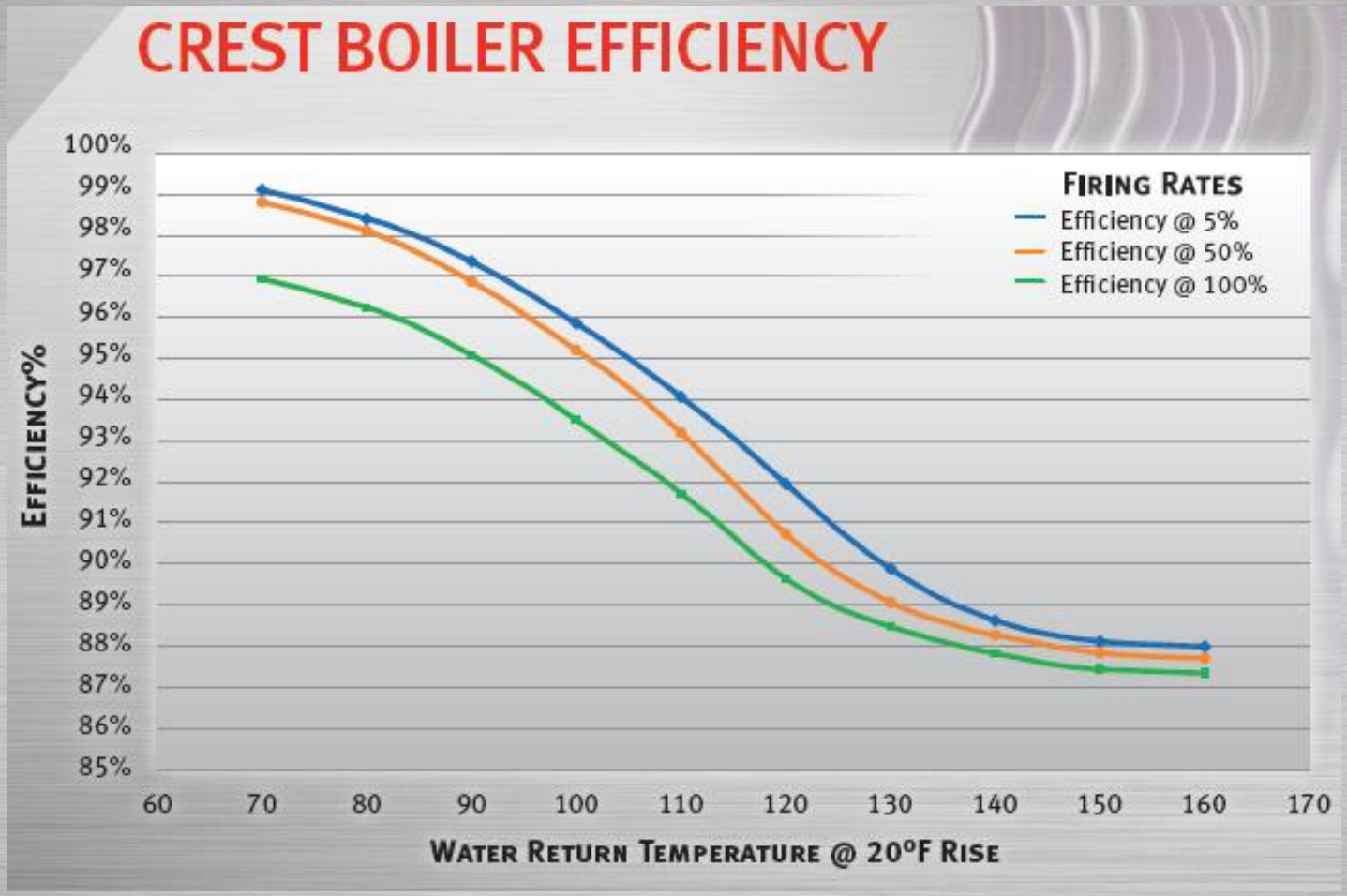
Modulation or turndown for heating products allows the unit to throttle the heat input to match the demand for heating. Matching the input to the output reduces or eliminates standby and off mode energy loss. Load matching is promoted by ASHRAE 90.1, the Consortium for Energy Efficiency (CEE) and the American Consortium for an Energy-Efficient Economy (ACEEE).

Loss of Turndown



If standby losses for a heating system account for just 0.2% of the system input, then load matching saves more energy than the combustion fans consume. Even if the limitations applied by the fan rule save 30% of the possible fan energy consumption, that is still less than 0.07% of the total energy used by the boiler or water heater. Restricting the usable range of combustion fans will lose more energy than it saves.

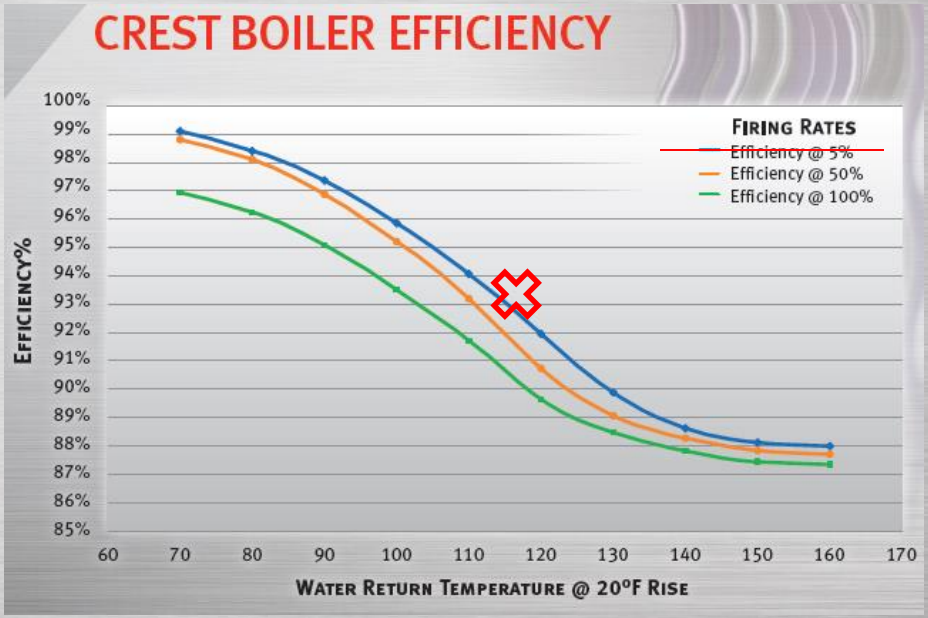
Loss of Turndown



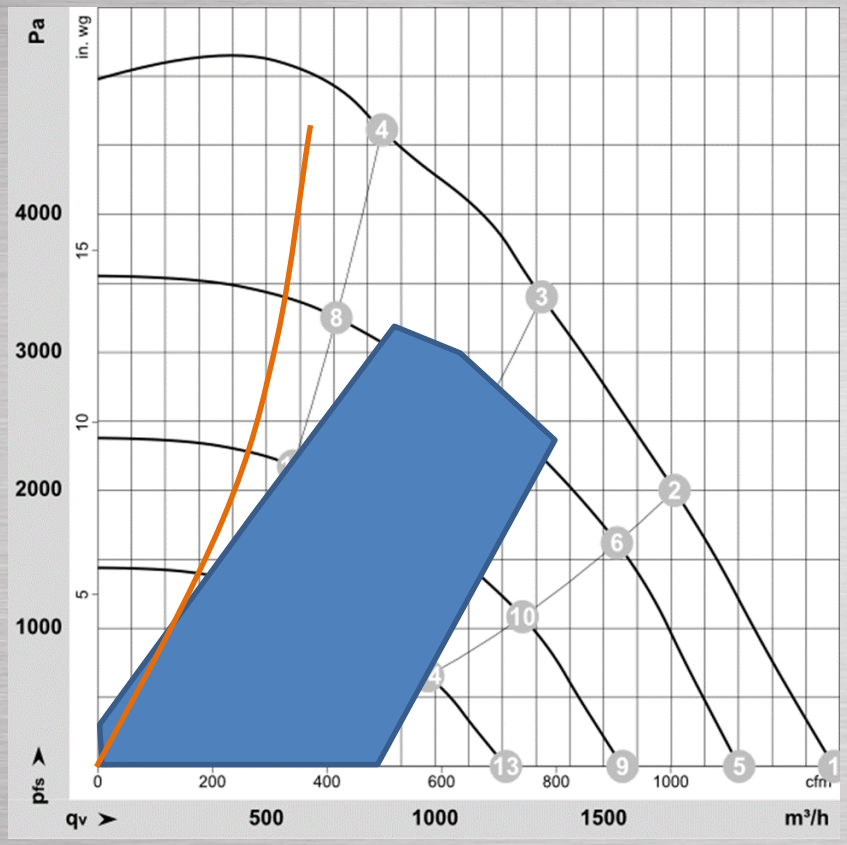
Loss of Turndown

When modulating range is reduced, the top lines of the efficiency curves are lost. Operating efficiency will drop.

In addition to off cycle losses, loss of modulation is likely to drop operating efficiency by another 1% because the best efficiency is often at the lowest input rate.



Restricted Air Flow



High efficiency heat exchangers create turbulence and enhance surface contact to maximize heat transfer. This creates high pressure drops and may go outside the peak fan efficiency curve.

Restricted Air Flow

Since imbedded combustion fans are not excluded from the CEC Fan Rule, some high efficiency designs (ARMOR) will be eliminated and replaced with more free flowing, lower efficiency models.

The rule would make 98% efficient products illegal and allow 85% efficient products. Fan power savings could be as high as 0.1% of the total energy input and the efficiency loss would be 12.9%.

Summary

We recommend exclusion of imbedded fans used for combustion air for products including boilers, water heaters and pool heaters. The potential efficiency losses if these fans are not excluded are 10 to 200 times greater than the energy savings.

QUESTIONS

COMMENTS