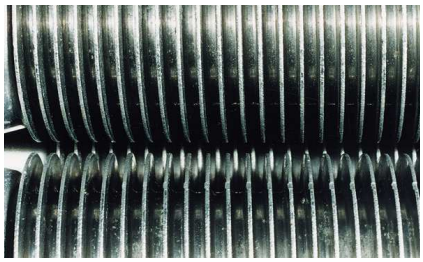
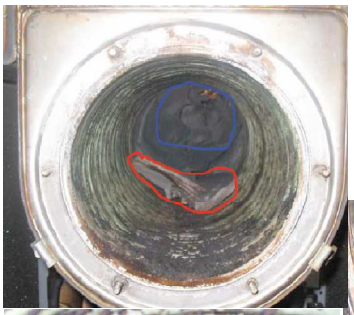
FINNED TUBE HEAT EXCHANGERS

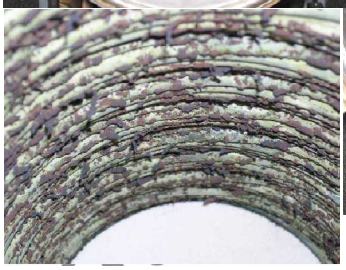


New aluminum fin heat exchanger surface

Same heat exchanger surface after short term use

HEAT EXCHANGERS

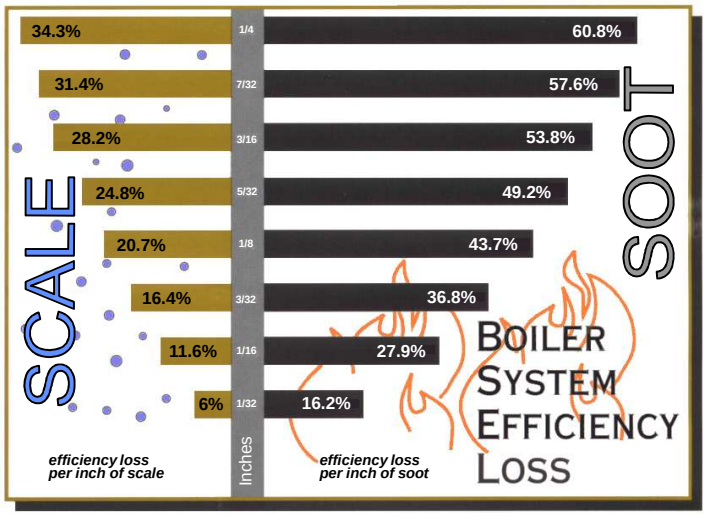




All stainless steel heat exchangers are not equal!

e

The affects of soot and scale



Source: Department of Building Inspection, Milwaukee, Wisconsin
Calculated with formulas from Mark's Standard for Mechanical Engineers, ninth edition

CONDENSATE DISPOSAL

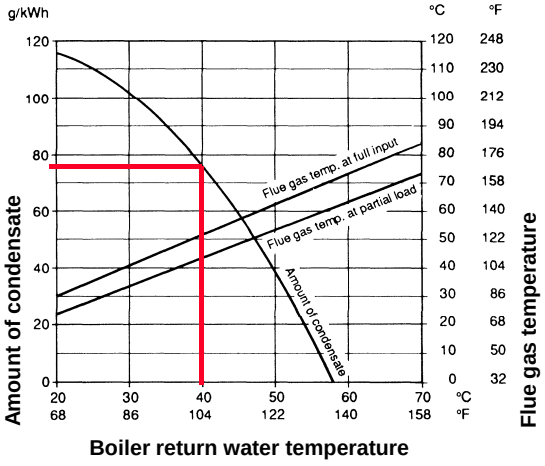
How much condensate will be produced?

What do we do with it?

AMOUNT OF CONDENSATE

Example:

How much condensate will be produced by a 3,000 MBH at return water temperature of 104°F/40°C?



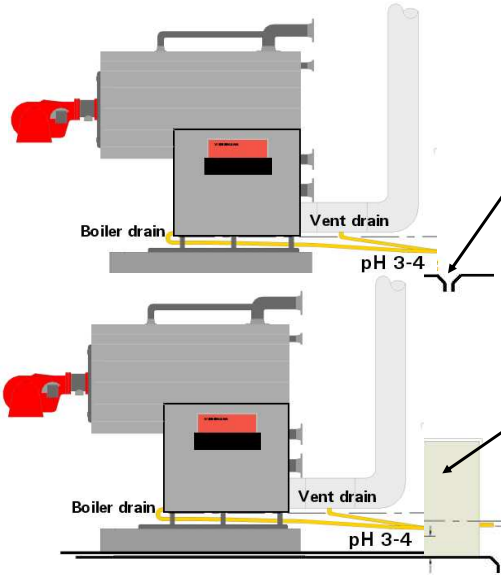
=75 g/kWh x 984 kW
=73,835 grams (73.8kg)
=73.8 liter
=19.5 usg

19.5 usg/hr of condensate from boiler

Components Tested	Drinking Water Limits	Wine	Condensate DIN-DVGW Test
	mg/ltr.	mg/ltr.	mg/ltr.
Lead	0.04	0.1 - 0.3	< 0.01
Cadmium	0.005	0.001	< 0.005
Chrome	0.05	0.06 - 0.03	< 0.01
Copper	3.0*	0.5	< 0.01
Nickel	0.05	0.05 - 0.03	< 0.01
Mercury	0.001	0.00005	< 0.0001
Vanadium	-	0.26 - 0.06	not determined
Zinc	5.0*	3.5 - 0.5	< 0.05
Tin	-	0.7 - 0.01	< 0.05
Sulphate	240	5 - 10	4.6
pH Value	6.5 - 9.5	3 - 4 (at 1.9 - 07 g/ltr. tartaric acid)	3.5 - 5 Without neutralization

Comparison of condensate components

CONDENSATE DISPOSAL
Straight to drain, or with neutralization



CPVC pipe sloped towards drain

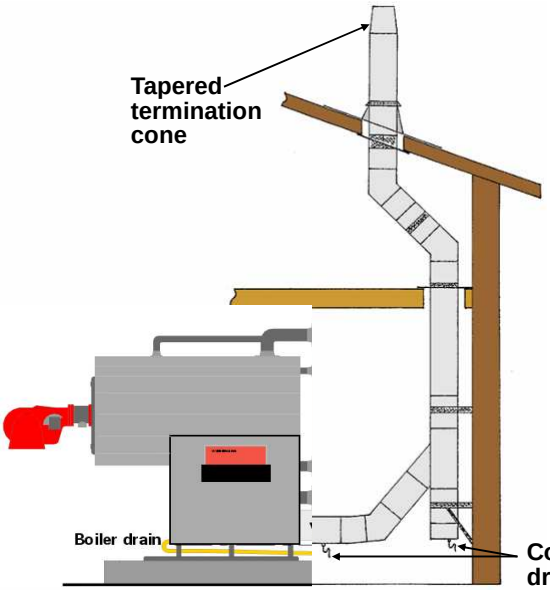
NO Copper!

Separate lines required

Plastic condensate neutralization tank. Fill with crushed limestone.

Foil 7
April 2010

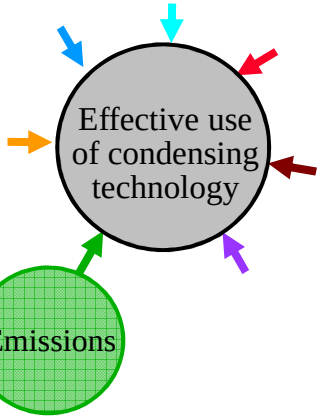
Positive Pressure Venting



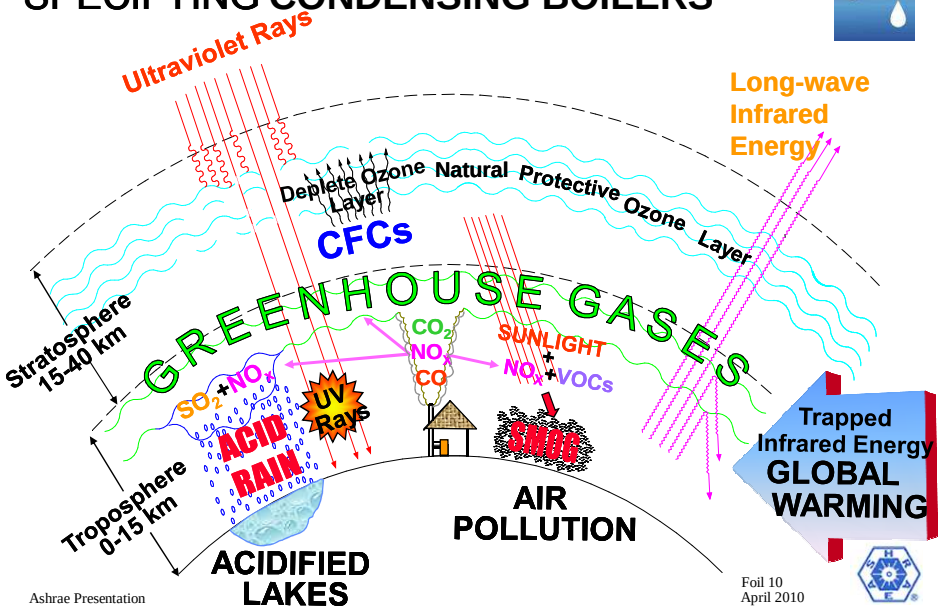
- **Stainless steel chimney –AL29**
- **Single wall**
- **Gas and water tight**
- **Typical flue gas temps: 77°F to 227°F**
- **Should only need to be single wall!**

Foil 8
April 2010

FACTORS INFLUENCING EFFECTIVENESS OF CONDENSING TECHNOLOGY



WHAT IS ANOTHER REASONS FOR SPECIFYING CONDENSING BOILERS



CONSTRUCTIVE AND PHYSICAL REQUIREMENTS FOR CONDENSING BOILERS

- Combustion with minimal excess air (high CO_2)
- Fully modulating burner
- Low heat exchanger surface temperatures
- Parallel flow of flue gas and condensate
- Counter-flow of flue gas and heating water
- Highly corrosion resistant material

SYSTEM DESIGN REQUIREMENTS FOR CONDENSING BOILERS

- Low temperature heat release surfaces
- Modulate water temperatures with outdoor reset controls
- Higher system water temperature drops
- Piping layouts to reduce boiler return water temperatures

BENEFITS FROM USING CONDENSING BOILERS

- Lower energy costs
- Lower environmental impact
- Saves having to change boiler for emissions reasons
- Makes customer happy for these reasons
- Makes you look good too!

CONDENSING BOILER TECHNOLOGY

Any Questions please?

THANK-YOU

MULCAHY
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