Heat Recovery Economizers Commercial Hot Water to Industrial Steam

October 2012

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Business Summary

- Boilerroom Equipment, Inc (BEI) engineers and manufactures the HeatSponge brand of heat recovery products outside of Pittsburgh, PA
- Privately held by Barry Alberts, President and Vince Sands PE, Vice-President
  - Profitable
  - No debt
  - No outside investors
  - All business activities financed through retained earnings
  - Allows us to improve and develop new products and in the best long-term interest of the company

Boiler Heat Recovery

- Steam boiler economizers
  - Steam boiler economizers ranging from 25 HP to over 150,000 pph boiler capacity
  - Fully repairable design for both conventional and condensing applications
  - Wide variety of metallurgies allow for flexible application
  - Most modern design available to industry
  - Typical efficiency improvements of 3% to 10%
- Hot water boiler economizers
  - Typical efficiency improvements of 3% to 20%
  - Significantly better returns than most condensing boilers

Economizers 101

- The single biggest loss of boiler efficiency is energy in the products of combustion exhausted to atmosphere
  - Sensible energy in the form of post-combustion heated air
  - Latent energy in the form of water vapor formed in the combustion process
- Economizers transfer the heat in flue gas to a water heat sink, most typically boiler feedwater for steam boiler applications
- Installed inline between the boiler exhaust and stack
- Since a boiler does not need an economizer to operate an installation will be based primarily on its economic justification

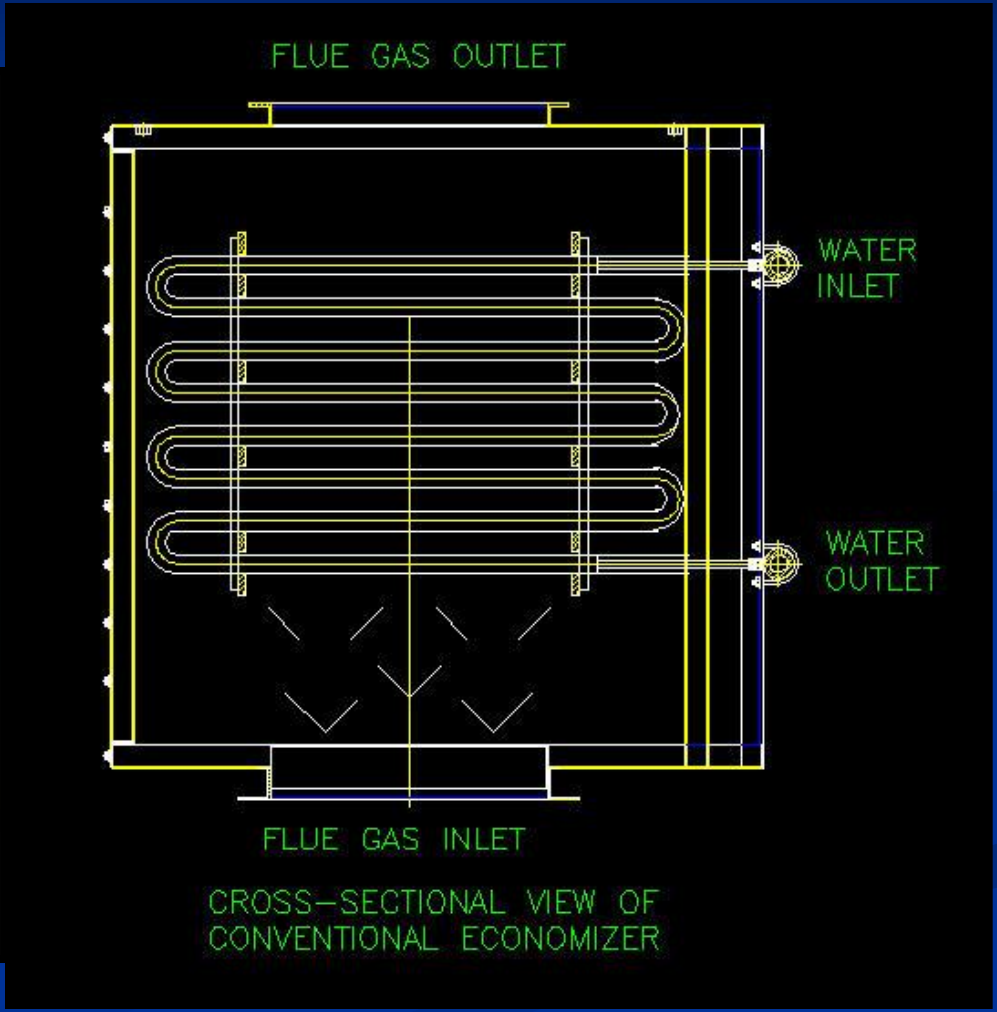
Condensing Defined

- "Condensing" is probably the most overused and least understood word in the industry
- Condensing refers to the ability to recover the latent heat of vaporization from water vapor formed in the combustion process
- Condensing can only occur when the temperature of the water to be heated is lower than the dew point of the vapor, approximately 135 deg F for a natural gas fired boiler at 3% O2

Steam Boiler Economizers

- Flue gas backpressure most important design parameter
- Typical conventional boiler economizer applications and location of installation
  - Boiler feedwater heating
    - Installed between feedwater tank and boiler
  - Make-up water (for applications with high make-up water rates)
    - Installed between softener and feedwater tank or circulates from a tank to take advantage of improved heat transfer from the greater temperature differential
  - Process water flow not related to boiler steaming rate
    - Wash down water
    - Process water
    - Potable water
    - Space heating water

Steam Boiler Economizer



HeatSponge Boiler Economizers:
www.heatsponge.com

Installed Economizers

Installed Economizers

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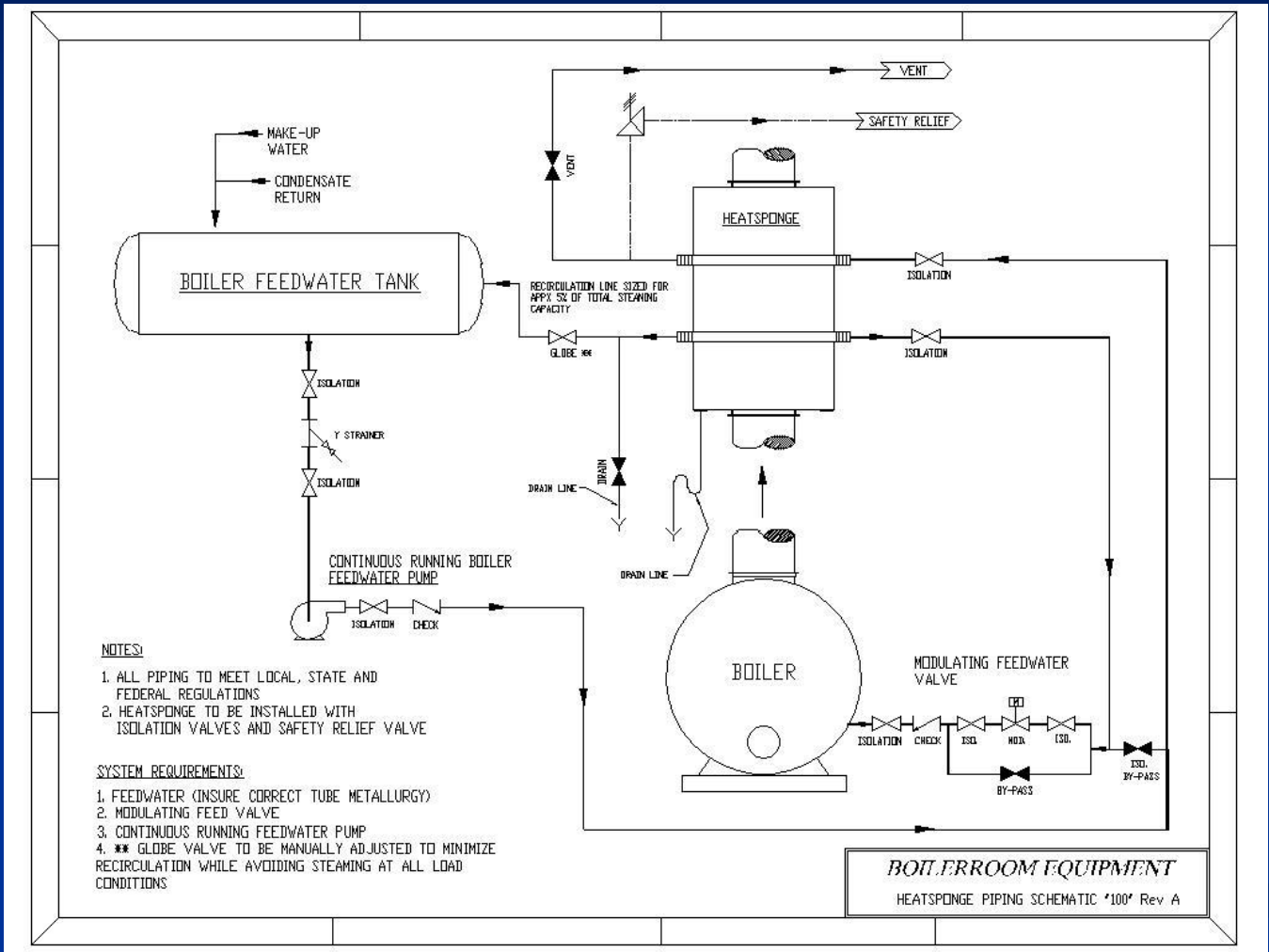
Steam Boiler P&ID



Two-Stage Economizers
Steam Boiler Economizers

- Designed to provide the maximum efficiency gain on steam boilers
- Utilizes two separate economizers in a common casing to maximum multiple heat sinks
  - 1st Stage for preheating boiler feedwater
  - 2nd Stage for preheating condensate return, make-up water, or other
- Two stage economizers can realize efficiency gains of 6% to 10% or greater depending on the heat sink

Two-Stage Economizer Stacked

Installed Two-Stage Economizer

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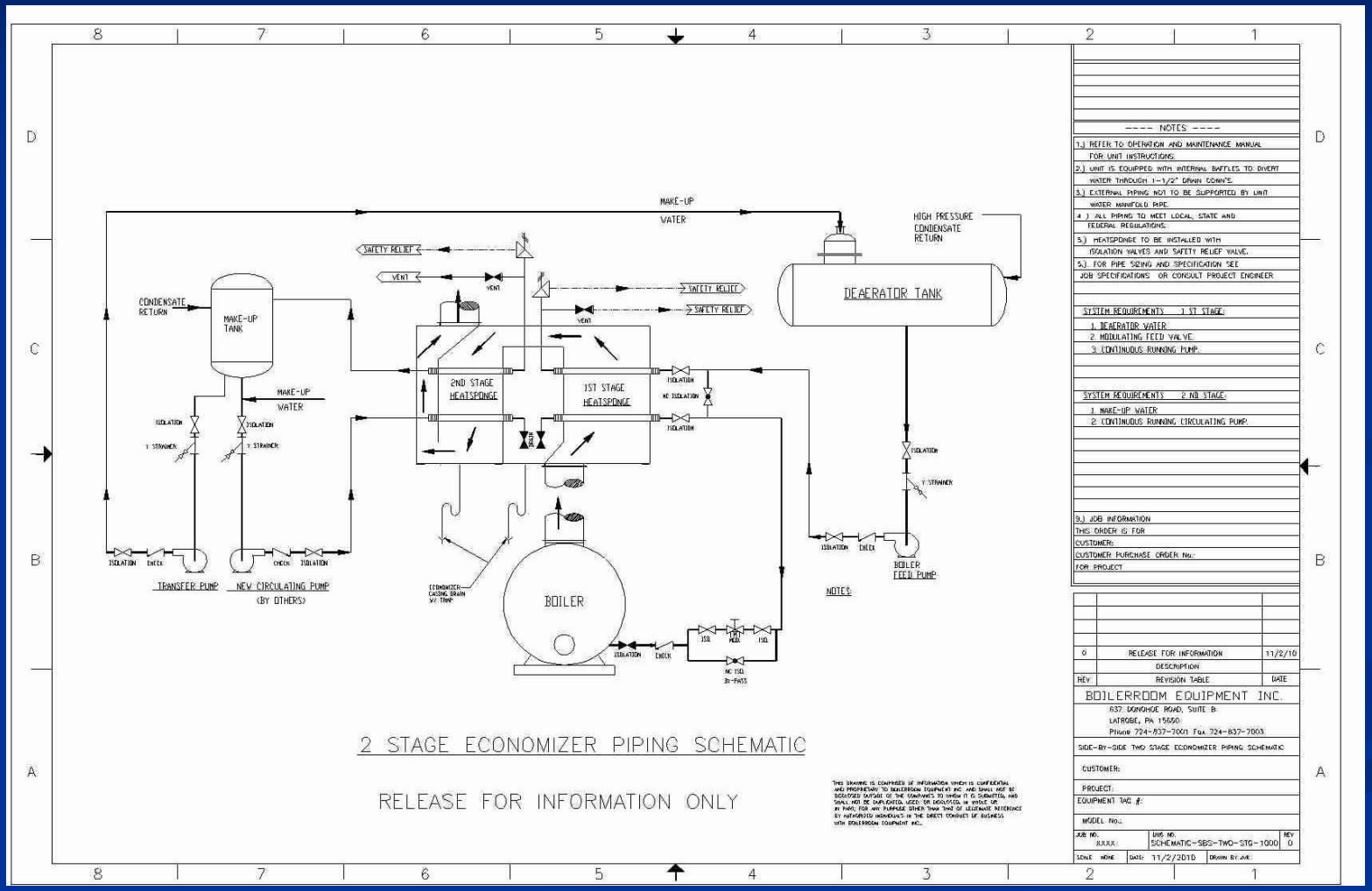
Two-Stage Economizer Side-by-Side



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HeatSponge Sidekick

When is the last time a product changed an entire industry?

HeatSponge Sidekick Economizers

- Condensing economizers for hot water boilers
  - New or retrofit installations
  - Stainless steel construction
  - Customized to each application
- Eliminates the need to demolish existing conventional boilers and retrofit new condensing boilers to achieve same outcome
- A revolutionary change in the design of commercial hot water systems
- The most important commercial boiler product since the development of the condensing boiler

Existing Non-Condensing Boilers

- Before the only way for non-condensing boiler owners to achieve condensing efficiencies was the demolition of their plant and installation of new condensing boilers
  - Extremely expensive
  - Time consuming
  - Requires new operator training
  - Limited to natural gas firing only
  - Limited to the burner and controls supplied by the condensing boiler manufacturer
  - Larger capacities require multiple condensing boilers

Retrofit HeatSponge Sidekick

- Sidekicks are substantially less expensive than condensing boilers
- Designed for the greater water flow rates associated with water boilers when compared to steam boilers
- Allows owners to use rugged, proven, and easy to maintain conventional boiler, burner, and control technology
- Installation can be quickly accomplished in a few days
- Allows for oil standby
- Common Sidekicks can service multiple boilers for further cost savings
- Can incorporate outdoor air reset schedules
- A simple Thermostatic Bypass Valve protects the conventional boiler from shock and condensation
- Will achieve the same efficiency as any condensing boiler for the same operating conditions!

New Boiler Installations

- Advantages of a Sidekick paired with a new conventional boiler
  - Lower overall cost for most boilers over 2 mmbtu
  - Allows for the use of rugged, long-lived, and easy-to-maintain conventional steel, cast-iron, or similar boilers
  - Can utilized any burner and controls
  - Duel-fuel gas & #2 fuel oil capable
  - A single larger boiler is far less expensive to purchase, install, and start than multiple smaller condensing boilers
  - Higher efficiencies than condensing boilers achievable when operating at elevated supply and return temperatures

HeatSponge Sidekick
Type II arrangement shown

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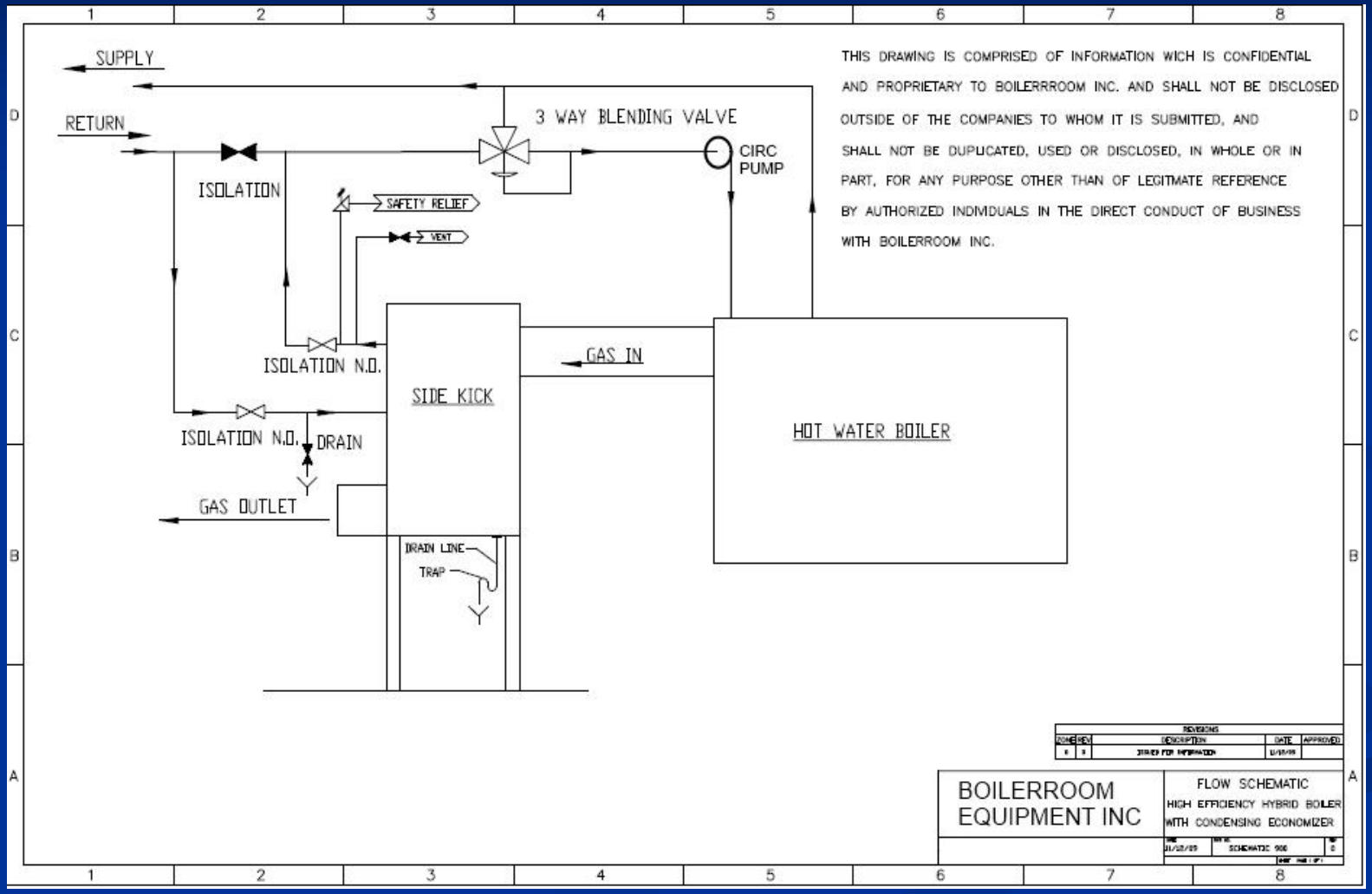
HeatSponge Sidekick P&ID



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Example Applications

- Schools
  - There are thousands of schools with conventional boilers that due to budget realities have not yet been able to replace existing boilers
  - A common Sidekick can service multiple redundant boilers allowing for the same efficiency gain as a condensing boiler at even lower installed price
- Apartments / Condo's / Nursing Homes
  - Tens of thousands of buildings that tend to be cost constrained

So if it's so revolutionary why hasn't anyone done it before?

- Extreme amount of variability in commercial boiler systems makes catalog-approach nearly impossible
  - Cost: The market-price level cannot support engineering expenses associated with a customized item
  - Draft: positive or negative and how much?
  - Heat Recovery: cannot base on boiler size as heating surface area requirements are dependent on too many variables
  - Fabrication: Standardized designs are required to keep costs as low as possible

How we did it

- We utilized a Mass-Customization approach to the Sidekick product line
  - Wikipedia definition: Mass customization is the use of flexible computer-aided manufacturing systems to produce custom output. Those systems combine the low unit costs of mass production processes with the flexibility of individual customization.
- We have applied the same methods computer manufacturers use to customize individual orders to an assembly-line product and be able to offer at relatively low cost

Meet Bruce

- "Bruce" is the name of our fully automated, real-time on-line sales engineer
  - An internet-based software program that designs, estimates, and creates proposals for all HeatSponge products in real-time
  - Represents over 10 years of continuous development
  - Unmatched by any company in the industry
  - Virtually eliminates overhead costs associated with supporting the sales and engineering of all HeatSponge products

Sidekick Assembly

- Automating the sales and engineering process was half of the equation – the other was a developing a design that allowed for individual unit customization while maintaining low cost manufacturing
- The Sidekick is built of standardized parts that can be interconnected in various configurations to achieve the optimum heating surface geometry
- As I like to say "Everything I needed to know to build a Sidekick I learned playing with Lego's"

Example Application

- Let's start with a school that has three (3) existing cast-iron sectional boilers
- Each 2.0 mmbtu input
  - Existing fuel-to-steam efficiency 79%
  - Supply 180 deg F – return 160 deg F
- Customer wishes to achieve 92% efficiency and incorporate outdoor air reset
- Two potential solutions
  - New Condensing Boilers (traditionally the only option)
  - Retrofit Sidekicks (the new option)

New Condensing Boilers

- Budget six figures to get started
- Solicit bids for
  - Extensive engineering expense to redesign the boiler system
  - Purchase three new condensing boilers
  - Demolish the existing plant
  - Install the new boilers
  - Integrate new controls
- Allow weeks to execute the project
- Train operators on all new equipment
- End up with a 92% efficient boiler

Sidekick Approach

- Significantly less engineering support required
- Allow Bruce to evaluate and design a unit
- Delivery will be about 4-5 weeks ARO
- Installation should not take more than around two days
- End result is a 92% efficient boiler for a fraction the cost, time, and headache of the new boiler room approach

Why are Condensing Boilers so Expensive?

- The single most expensive issue with any condensing boiler is the need to build the entire vessel out of corrosion resistant alloy when only the area actually in condensing needs to be corrosion resistant
  - Stainless Steel
  - Cast Aluminum
- The Sidekick is designed to accomplish the condensing allowing the rest of the boiler to be built of more conventional, longer lived, and less expensive materials
  - Carbon steel
  - Cast iron
  - Copper

Sidekicks on Steam Boilers

- Sidekicks are not limited to hot water boilers
- As the ability to handle high water flow rates is a key aspect of all Sidekicks they can be used in other applications
- Case Study: Resort on Las Vegas Strip
  - 300 HP (13 mmbtu) 150 psig firetube steam boiler
  - 400 deg F exhaust temperature
  - Unit designed for low backpressure so draft inducer would not be required
  - Sidekick installed to preheat domestic hot water
  - Unit in full condensing providing up to a 12% increase in efficiency

Fundamentally Changes the Condensing Boiler Market

- There is nothing a condensing boiler can offer that a conventional boiler equipped with a Sidekick cannot do more efficiently and at a lower price.
- Condensing boilers will now always be at an economic and operational disadvantage
- Sidekicks allow owners to use conventional boiler, burner, and control brands they are experienced with and prefer
- Sidekicks allow for duel-fuel boilers (Sidekick bypassed when firing oil)
- Condensing boilers offer no advantage over a Sidekick-equipped conventional boiler

BEI

BOILERROOM EQUIPMENT INC.

- Thank you for your time and consideration
- We appreciate the Energy Solutions Center invitation to be here today
- Feel free to ask any questions
- Boilerroom Equipment, Inc, Export PA
- Main Phone 866-666-8977
- Bruce is accessible via our website at
  - www.heatsponge.com