

THE

US

Boiler Report



Published by U.S. Boiler Company
Manufacturer of Burnham® Brand Products

May, 2014 • Vol 2, Issue 5

HAPPY BIRTHDAY

TO

US



It all started as an idea at a department meeting. After one year, 12 issues, a couple of magazine-circulated print editions, and thousands of sign-ups, we, at the U.S. Boiler Report can finally say that we're out of our rookie season. With this edition, we move into the second full year of publication, and we couldn't be more excited to do so. It's been quite

an interesting journey. Along the way, we've gotten a bunch of great tips from Ron Beck, gained greater perspective on the industry as a whole from guest columnists and gotten insight and tips to help business run better from Ellen Rohr. Through our contractor feature section, we've also gotten to know some of you as well, and seen your work firsthand.

It's been a fun ride, and we're glad to have had the opportunity to bring it to you for the past year. Speaking for everyone involved in the USBR, I can say confidently that we are excited to see what the next year holds...and the year after that...and the year after that.....

Thanks for reading!

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Solar-Fired Steam Boilers Making Power in Southwest

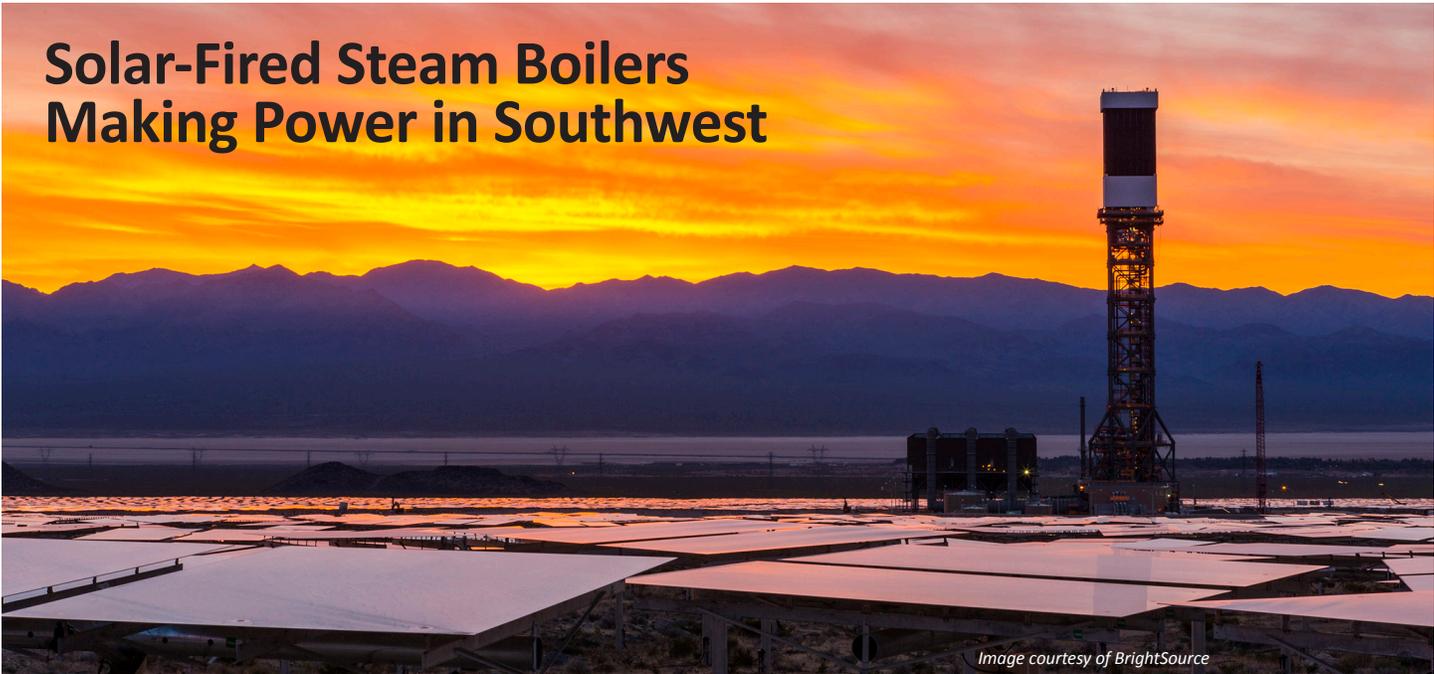


Image courtesy of BrightSource

About half-an-hour southwest of Las Vegas, just across the California border is the largest solar thermal power system in the world. The Ivanpah Solar Electric Generating System is a colossal network of mirrors reflecting the Mojave Desert sun to “boilers” atop three, 459-foot tall towers. It’s a design called concentrated solar power (CSP). The boilers produce steam, which spins turbines at ground-level to generate electric power.

To concentrate solar radiation on the boilers, 347,000 mirrors the size of garage doors are spread across 173,500 heliostats. Heliostats are mounting devices that automatically track the sun’s movement across the sky, keeping the greatest amount of energy on the boilers as possible.

The super-concentrated energy from the sun heats the boilers to roughly 1,000°F, actually causing them to glow like massive torches lighting the desert floor below. The project began in 2006, and covers 3,500 acres. The mirrors farthest from the tower are over half-a-mile away.

When it comes to electric power generation, solar-steam plants have

advantages over photovoltaic plants. They’re more reliable and less prone to production fluctuation.

This particular installation was designed to produce enough energy for 140,000 homes. When the site officially came online in February, Ivanpah effectively doubled the amount of commercial solar energy produced in the United States. Under long-term contracts, Energy from Ivanpah’s Units 1 and 3 is sold to Pacific Gas & Electric, while power from Unit 2 is sold to Southern California Edison.

That’s a boiler?

The unique, cubical solar boilers – or Solar Receiver Steam Generators (SRSNG) – each weigh 2,100 tons and measure 52 feet from side to side.

Unlike a traditional, internal-combustion, fossil-fuel boiler, the boilers at Ivanpah collect energy from outside the unit. This drastically changes their design compared to what we’re used to. The four walls of an SRSNG act as the heat exchanger, soaking up radiation from outside, making it an “external combustion” boiler.

This means that all the components

(pipe, supporting equipment, valves, and personnel access) need to be completely confined inside those walls. Given the intensity of the solar radiation aimed at the SRSNG, anything exposed is subject to severe damage.

But the temperature inside the structure was another challenge. The top and bottom of the boiler are open, so air movement helps, but massive amounts of insulation on the piping and inside of the walls was needed to keep instruments operating correctly, let alone human traffic.

Sectional, sort of

In a way, the SRSNGs are sectional boilers. Each of the four black walls that make up the boiler’s “box” shape is horizontally divided into three sections. The reheater, at the bottom, is the narrowest section, and receives the least amount of heat. The evaporator, in the middle, is the largest section and is exposed to the most radiation. The superheater is located at the top.

Water in a closed loop vaporizes as it rises through the boiler, before heading down to the turbines to generate power.

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Bare Bones BizTips

By
Ellen Rohr

Balance Sheet Basics

(Or what I learned from Warren Buffet)



Business is easy. You can fix your financials and you can turn around a bad financial situation...if you are willing to apply some business basics.

In business, there is ultimately *one* financial Scorecard: The Balance Sheet. This is the Balance Sheet equation...

Assets = Liabilities + Equity

Assets are what you **have**: Cash, Receivables, Inventory, Trucks, stuff. Liabilities are what you **owe**: Payables, Loans. Equity is what you **own**. So far so good? (You can also download a FREE Glossary of Weird Accounting Terms at www.ellenrohr.com)

Warren Buffet's Rules for Business...

I love Warren Buffet. The guy makes money the bare bones basic way. He builds companies that make profits. Here are his rules for business...

Protect the Assets. The assets are your 'stuff.' What you have. The first financial objective is to protect the wealth you have.

Grow the Assets. The second financial objective is to expand the 'stuff.' Grow cash and other Assets.

That's the game! Let's look at the three ways that you can grow Assets.

Through Liabilities. You can borrow money. When you buy a new truck, and get a loan for that truck...Assets go up and the Liability (a loan) goes up.

Through Owner Investment. You can put your own money into the company. Perhaps when you got started you wrote a check from your personal checking account and opened up your business checking account. Assets go up and Owner's Investment (an Equity account) goes up.

Through Profits. Sell stuff for more than it costs and create profits. Assets go up and Net Income goes up. This year's profits show up in the Equity section of your Balance Sheet. When you lose money – sell stuff for less than it costs you – Equity goes down and Assets go down. That's the elegant, beautiful, sometimes horrible truth of the Balance Sheet.

Are you winning or losing the game?

Make sure the Balance Sheet is right. Then, take a look at the numbers. If you have more Liabilities than Assets, you are going backwards. You'll have a negative Equity balance. You may be able to fix it. The long term fix addresses the reason you got in trouble in the first place. You have got to charge more than it costs. And you have to have enough Sales at the right price to cover all expenses and make a profit. You might be able to borrow more money and you may be tempted to put more of your own money into the company. You might even entice an investor to infuse some

cash. However, the only way to create wealth is to generate profits.

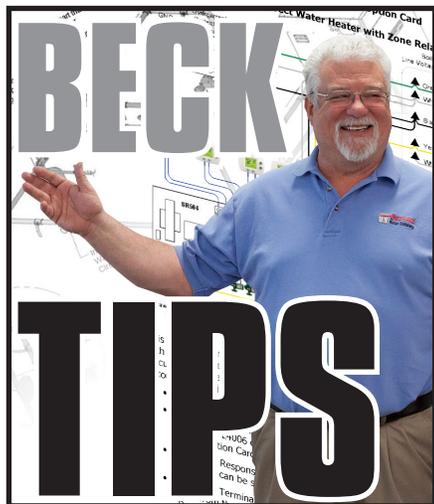
Profits solve lots of problems.

There are worse things than going out of business. Like building a mountain of debt or getting into tax or bank fraud trouble. You *could* go out of business. (It may be your best, most liberating option.) Or, you may be able to fix the one you've got. Ready to make the leap to profitability? I challenge you.

Raise your prices. Raise your standards. Be willing to make the money you deserve. It may just be that easy.

Ready to break FREE? Join me for **The Challenge**... <http://www.ChallengeMyBusiness.com> You can also reach me at 877.629.7647 or contact@barebonesbiz.com

A business plan can get you all on the same page! Less stress and drama, MORE MONEY! Download Ellen's free Biz Planning Video Series at: www.BareBonesBiz.com You can also find "ellenrohr" on Facebook, Twitter and Google+.



By Ron Beck,
U.S. Boiler Company

Here in the Commonwealth of Pennsylvania, as of July 2004, we're required to install a Low Water Cut-Off (LWCO) on every new hot water boiler installation. More states are added to the list every year. Among the states that require this statewide - or in part - are New York, Massachusetts, Virginia, Rhode Island and Maryland. Prior to that 2004, it was only required on 400,000 BTUs and larger, as well as commercial applications. With the use of the US Boiler IQ control system, we had an opportunity to make adding an LWCO to most hot water boiler installations a snap - literally.

Last month we talked about the Optional Control Panel (OCP). This panel is part of the IQ control system. It allows the use of plug-and-play cards. We use this control strategy on the ES2, Series 3 and ESC gas hot water boilers and the MPO-IQ oil boiler. The same cards are used for all the gas and oil boilers, making life easier for our distributor friends. For more information on the OCP, see last month's issue of the US Boiler Report on our website www.usboiler.net. To locate it use the search box at the upper right of the home page.

The LWCO card can be purchased as a manual or automatic reset version. If the probe encounters a low water



Does Your State Require a Low Water Cutoff?

event, it will shut down the boiler. If the event goes away, the automatic LWCO card will automatically reset and the boiler will re-fire. If you're using a manual reset card, someone will have to manually reset the card. On a side note - if you purchase the LWCO card with manual reset upon installation, you *will* be required to reset it when the boiler is full of water and electric has been turned on. The manual reset card is certified for CSD-1 applications, for use in commercial installations.

The LWCO package includes a wire, probe and the LWCO card itself. While piping the boiler, install a tee with a 3/4" opening on your supply piping, slightly above the top of the boiler. Make sure the supplied wire is long enough to reach between the probe and the LWCO card. Screw the probe into the tee using pipe dope but not Teflon tape, which could affect the signal to the boiler. It's best to mount the probe in a horizontal position, not vertical. I also prefer not to see the probe mounted in the end of a tee. I say, "always horizontal and into the bull of the tee."

To plug in the card, line up the four corners and slide it into place. Lining up the corners removes the possibility of bending the contact pins on the OCP. Once the card is plugged in, remove the nut on the end of the probe using a 5/16 wrench or nut driver, slide the eye of the supplied wire onto the stud, and tighten the nut. Route the wire to the LWCO card and plug the female spade connector onto the male stud on the card. Installation is complete.

Next fill the boiler with water, purge out the air and turn on the power. If the card is a manual reset version, you'll have to reset it. We're now ready for operation. Give the boiler a demand for heat or hot water and everything comes to life.

If you look at the LWCO card, you'll

probably notice the two green lights. One is on steady the second blinks occasionally. The steady light means there's power to the card. It should be lighted as long as there's power to the boiler. The intermittent green light means the card is communicating with the IQ control panel. There are two other lights on the card that aren't usually illuminated. An amber light indicates that the signal from the probe is weak. This usually means the probe requires a cleaning. A red light means the card is in a lockout state. If the red light is on and the low water event goes away, the automatic reset card will re-fire the boiler and the manual reset card will need to be manually reset. A loss of power will *not* require a reset of the card.

Troubleshooting this card is very simple. If there's a red light on the card, OCP will be flashing C# (# being the card location that the LWCO card is plugged into, and open limit). This means there's an open limit on the card plugged into that location (one of three locations on the OCP).

To access the card press the "I" button on the OCP until the display shows the same card number that the LWCO is installed in. For instance, if the card is plugged into location two, you would press the "I" button until you see C2 on the OCP display. Next, press one of the arrow keys. This gains access to the card, and the little window on the OCP will now alternately display ERR and a number; the number being the error code. Error codes are printed on the front label of the card for reference.

If the problem is a low water event, and there is water above the probe, you'll have to troubleshoot the card, wire and probe. Sound hard? Naw, it is simple...you can actually check

- Continues, see "LWCO", page 8

Retrofit of Historic Proportions



Few folks know it, but York, Pennsylvania was the first Capital of the United States. It's true; named after York, England, and established in the 1740's, York became capital in 1777, but it lasted for less than a year.

At the time, the colonies' government was located in Philadelphia and was moved to nearby Lancaster, PA, (home of US Boiler, we might add) in response to the mounting threat of British invasion. It was moved again quickly, when officials decided it wasn't prudent to have the Pennsylvania State Capital and the nation's capital in the same place. So, they relocated it to York before

making it official, across the Susquehanna River - which at the time was a more imposing barrier than it is in modern day.

Roughly one hundred years later, during the Civil War, York and the nearby Susquehanna River played an important role in shaping the nation that it once helped build. The town's history is reflected in its architecture, its locally-famous Central Market York, public buildings and the businesses that call it home.

While Shiple Energy, founded in 1929, isn't the oldest firm in the area, it is the largest locally-owned provider of home heating energy in central PA.

But the pros at Shiple do more than deliver fuel. The company employs over 75 HVAC technicians serving both sides of the big river.

They have several crews that focus exclusively on boiler retrofits, and Linda Kline, accounts payable coordinate for Shiple, knows the quality of work those crews do.

A relic

When Kline purchased a home in York in 2009, she loved everything about it. Her elation lasted until the heating season, at which point the massive, natural gas-fired, sectional boiler in her basement belched to life.

The boiler was the home's original. The 1,800 square-foot, 70-year-old brick Bungalow doesn't show its age, but the boiler did.

"The temperature was always fluctuating and it was never comfortable," said Kline. "Not to mention the cost to heat the place." She was paying between \$1,200 and \$1,500 for gas each winter, and that didn't include domestic hot water production.

Long, low cast iron radiators heat the home on both levels. The original system was never balanced correctly, and the supply water temperature

– Continues, see "Conquer", page 6

–“Conquer”, continued

was too high. Some rooms were sweltering, while others would have made great potato cellars at the turn of the century.

One of their own

Inevitably, Kline grew weary of the comfort issues in the home, not to mention her energy costs. But she didn't have to look far for a solution. She simply called from Shipley's main office to the HVAC office, and asked for Sales Manager Dan Senft.

When he visited the home, he noticed two things immediately; high-gas connected load, and that venting a condensing boiler wouldn't be a challenge. That, along with Kline's wish to reduce her fuel use as much as possible, made the decision of which boiler to install a simple one.

“We sell a few different boiler brands,” said Senft. “The Burnham Alpine, though, is the premium package. It's an efficient, easily installed unit that – with a size range from 80 to 399 MBH - fits almost any application. Obviously, when Linda came to us with her project, we wanted to outfit her house with the best package we could.”

System revolution

In November of 2013, Shipley professionals arrived at Kline's house and tore apart the boiler, hauling it up the basement steps one section at a time. They also

discarded the weary electric water heater. An Alpine 80 and a 50-gallon Burnham Alliance sidearm tank took their place.

“It's like the guys gave my basement a makeover,” said Kline. “When they left, the room had doubled in size, and was cleaner than when they came.” The temperature is now consistently 68 degrees, as Kline likes it. No more coming home to a cold house.

After becoming accustomed to listening to her old boiler fire, Kline was worried that the new boiler wasn't working. When she called Senft to convey her concern, he simply asked, “Are your radiators warm?”

“I'm now paying \$550 per winter at the most,” said Kline. “Dan certainly led me in the right direction. But that's no surprise. They take good care of me.”

With the new system installed by Shipley, Kline's heating bills have been reduced by almost 65 percent, even with the addition of with the domestic hot water production, and during the harshest winter in recent history.

“It's nice not to have a heating system that witnessed the burning of the Wrightsville Bridge to stop the advancement of confederate troops from York to Lancaster during the Civil War,” said Kline jokingly, as the American flag waved patriotically on her front porch.



The home featured an ample compliment of high-volume cast iron radiators. While they were still in great shape, the original 70-year-old boiler supplying them wasn't



The new installation of an Alpine boiler and Alliance indirect water heater has led to an impressive 65% reduction in heating costs –during one of the harshest winters on record – and in spite of the addition of the indirect water heater.

Holohan's "Classic Hydronics" and Amazing Contribution



Great educators have the ability to entertain while instructing, to the point that attendees aren't sure whether they're at a seminar or at a stand-up show on the Vegas Strip. On April 9th, one of our industry's best was in Grantville, PA, presenting "Classic Hydronics."

Dan Holohan gave the seminar to benefit the OESP (National Association of Oil & Energy Professionals) scholarship fund. The 80 professionals in attendance caught Holohan's last seminar in Pennsylvania before he retires. They also watched as Holohan was surprised with a plaque naming the OESP Scholarship in his honor.

Holohan's friends know that his contribution to the industry isn't limited to charismatic training sessions. It even goes beyond his wildly-successful website, [HeatingHelp.com](http://www.heatinghelp.com),

where industry pros can post queries and receive "answers in an hour." His philanthropic efforts are in a class of their own, benefitting young men and women looking to learn the trade.

"Dan is a founding father of the OESP Scholarship program, and has remained a major supporter throughout the years," said Judy Garber, executive director of OESP. "Through Dan's efforts and generosity, OESP has awarded over \$250,000 since 1999. With much gratitude, we have named the first annual Dan Holohan Scholarship in his honor."

Growing up in New York's hydronic country, learning from great hydronic minds like Gil Carlson, and working as a manufacturer's representative lead him to become one of the nation's most respected consultants, authors and speakers on the topic.

"Holohan is a great trainer – the industry will be losing a valuable resource when he retires from teaching next year," said Dan Cork, VP of sales and marketing at US Boiler Company, after the recent "Classic Hydronics" seminar. "His seminars are very participatory and contractors shout out the

answers to some questions. They occasionally find themselves on the wrong side of the correct answer, but that's OK when it happens in this type of seminar. Dan's explanations are an opportunity for everyone to gain insight to the best possible installation practices."

Learning and laughing

The "Classic Hydronics" seminar opened with troubleshooting tips for older hydronic systems, with Holohan advising, "Enter each house with an open mind and a bright flashlight. Then, *be* the water". He gave a history of the development of water heating systems in the U.S., and how gravity systems competed with much less expensive – albeit more dangerous – steam systems.

"The circulator wasn't invented yet," he said. "So, gravity systems required massive pipes on the supply and return sides." The competitive environment inevitably resulted in technological developments for water systems including diverter tees, circulators, and a host of misfortunate-looking contraptions that all aided in water movement and heat distribution.

Before walking through the historic evolution of radiant heat as we know it, Holohan reminded the crowd, "If you see a component you can't identify, **DON'T REMOVE IT!** It could be the

lynchpin that holds the whole universe together. Take a picture, post it on HeatingHelp.com, and you'll learn a lot before throwing the whole system out of balance."

The radiant history portion of the presentation took attendees around the globe and back in time more than 100 years, with a lot of laughs along the way. The narrated photo tour began in England with radiant walls and ceilings, eventually making its way to the U.S.

Back across the big pond, Holohan's escapades in modern-day Deutschland taught him about square pipe, among other things. "*Ze pipe ist sqvare because ze corners are sqvare,*" he explained in a German accent in regard to radiators with exposed piping.

He got technical when he spoke of sizing circulators, placement of components and flow rates through different sizes of pipe. Reverse return piping, primary/secondary, single and two-pipe systems all came to life through the images he used.

If you've not yet attended "Classic Hydronics, you don't have long. Holohan is rounding out his last year-and-a-half of seminars before retirement in late 2015. Catch him in New York in June! <http://www.heatinghelp.com/seminar/97/Classic-Hydronics-Astoria-NY>

– “Solar”, continued

Each of the three SRSs at Ivanpah are designed to produce 845,252 lb/hr of superheated steam at 1,013°F, and 830,966 lb/hr of reheat steam at 905°F.

Flushing

For those that’ll still argue that the towers at Ivanpah don’t support a “boiler” in the sense that we’re accustomed to, read on. Before the SRSs were put into service, they went through a process called “steam blow” during final commissioning.

This is done by bringing the boiler to temperature and blowing steam off into the atmosphere instead of sending it to the turbines. The process clears scale, metal shards and other debris inside the pipes from construction. By not doing the steam blow process, the turbines could be harmed from the contaminants in the pipe.

Target locations in the piping system are checked and the process is repeated until it’s sufficiently clean. Without too much imagination, the steam blow process could be related to flushing a hydronic system.

Short cycling

To ensure a longer “runtime” and maximum hours of steam production per day, the boilers at Ivanpah have a jumpstart mechanism of sorts, if needed.

When the desert sun drops and steam production ceases, the water in the boilers cools dramatically. In the morning, natural gas-fired burners can be used to bring the boilers up from a cold-start. The water temperature is raised to that solar energy more quickly brings the units into production.

Service

As you’d expect, an installation like Ivanpah has its fair share of service demands. One of the more interesting jobs takes place at ground level. BrightSource Energy - one of the several enterprises with a share in Ivanpah – created special mirror cleaning robots.

The robots, which are controlled by one operator, travel the rows of heliostats at night, cleaning each mirror every few months. The machines, however, are top secret; BrightSource won’t show them publicly.

Spenny

Ivanpah’s staggering \$2.2 Billion price tag was shared by several enormous

companies, including Google. The station was initially connected to the power grid in September of 2013 but didn’t go into commercial operation until the end of the year. The site was officially dedicated in mid-February, 2014.

Contradiction

For conservationists, Ivanpah has been the topic of a few heated debates.

There’s a strange environmental Catch 22 surrounding such utility-sized solar installations. On one side of the coin, Ivanpah is providing green energy for thousands of homes, effectively reducing carbon emissions by reducing demand for coal, gas, or nuclear generated power. But on the other, the site has reportedly disturbed the natural habitat of threatened species of desert tortoise, and has proven fatal for birds, which may be confused by the mirrors, or possibly fly through concentrated solar radiation near the receiver.

But, no matter how you slice it, Ivanpah and the roughly 230 other similar installations in some state of progress – from initial planning to actual construction – in the United States all aim to reduce our dependence on non-renewable resources. And in many cases, it’s all thanks to a *boiler*.

Image courtesy of BrightSource

– “LWCO”, continued

the wire and the card at the same time. Disconnect the wire eye from the probe. Locate terminal 3 on the OCP which is right beside the T&T connections on the lower left terminal strip. Touch the eye to terminal 3 and hold it there. If the red light goes out and the boiler fires, this indicates that the wire and card are good, which means you have a bad probe or possibly used Teflon tape. If you do the above and the red light does *not* go out, remove the wire and

test for continuity on the wire before condemning the card. If you have continuity on the wire, the card must be replaced.

If it’s a bad LWCO card or a bad probe, you’ll have to remove the card and order a replacement. When you remove the card, you’ll get an error displayed on the OCP due to the fact that the card slot is now empty. Press and release the “I” button until you see “LRN” on the OCP display. Next press and hold one of the arrow keys until OCP re-appears on the display. You’ve now erased the card

from memory and the boiler will run as if there never was a LWCO card installed. When the repairs are made and the card is plugged in, it will automatically be put into memory and the boiler will operate. Again, as a reminder, if the card has a manual reset you will be required to reset the LWCO card.

The LWCO card is simple to install and troubleshoot. If you have not tried one yet, I suggest you try one and see how easy it is and you’ll probably never go back to installing and wiring the other types of LWCO controls to our boilers.

The U.S. Boiler Report is a monthly publication produced by Delta C, LLC in conjunction with U.S. Boiler Company. For inquiries or additional information regarding article submissions, please contact:

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