| DOCKETED | |
|---|---|
| **Docket Number:** | 19-BSTD-03 |
| **Project Title:** | 2022 Energy Code Pre-Rulemaking |
| **TN #:** | 236762 |
| **Document Title:** | Parker Boiler Co Comments - 2022 Energy Code Pre-rulemaking Title 24 Part 6 |
| **Description:** | N/A |
| **Filer:** | System |
| **Organization:** | Parker Boiler Co |
| **Submitter Role:** | Public |
| **Submission Date:** | 2/12/2021 2:43:44 PM |
| **Docketed Date:** | 2/12/2021 |

*Comment Received From: Parker Boiler Co*
*Submitted On: 2/12/2021*
*Docket Number: 19-BSTD-03*

## 2022 Energy Code Pre-rulemaking Title 24 Part 6

*Additional submitted attachment is included below.*

**PARKER BOILER CO.**
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1/20/2020

Attn: CEC
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Case Report
2022 Title 24 Part 6
Final Case Report
Codes & Standards Enhancement
Initiative, California Statewide
Utility Codes & Standards

Docket # 19-BSTD-03
2022 Energy Code Pre-rulemaking

We at Parker Boiler Co. have just recently become aware of the proposed changes. We understand the intent of the proposals and agree with the goal of reducing energy & GHG emissions. However, from studying this rule and the market we see that there is very little choice of boilers / burners that can achieve the proposed O2 requirements and Nox levels required. And if the one boiler that we see that may meet the requirements is purchased actually much more energy will be consumed in the state than if consumers are offered a choice of a smaller mass boiler due to the start stop nature of process applications.

We have some concerns with the boiler & water heating proposals however our major concern is with the O2 trim proposals. While these boilers over 5.0MM BTUH are at the very top of our boiler offering and most boilers we manufacture and sell are below this size, we are very concerned about this rule filtering down to smaller units as we do not believe all factors were considered in the rulemaking. We believe the requirement to run at 3% O2 on these boilers is too difficult to achieve and not practical. And that proper consideration of all the facts was not done. We will present many reasons why.

The following are some of our concerns:

**1.) Outreach**

In the 173-page document you make numerous references to the outreach, however we were never contacted regarding this proposal. Parker has been manufacturing boilers for 102 years in Los Angeles. We have thousands of boilers running in the state.

We are very upset we were never contacted previous to this point. We do not feel this is fair or equitable.

**2.) Outreach Contacts**

Page 159 lists 15 contacts that provided input, to my knowledge only one of these companies actually manufacturer an ASME “S” stamped boiler which would be considered a process boiler. This is very concerning to us. And not proper rule making.

**3.) O2 Trim Engaged Manufactures** Page 40

3.2.3- the first sentence says do not expect “technical feasibility concerns” is one we strongly disagree with. Here is why; The engaged manufacturers listed on page 40 include Paterson Kelly, Auto Flame & Cleaver Brooks.

Paterson Kelly does not list a boiler over 4.0 mm BTUH on their website nor do they make what Parker would consider a process boiler. What input did they have on O2 trim?

Auto Flame is a manufacturer of O2 trim systems not boilers to my knowledge. Isn't this like asking Elon Musk if the State should mandate all electric cars?

**Cleaver Brooks**

In researching the issue, they do make statements on their website that somewhat suggest that their firetube large mass, controlled furnace CBEX series boiler that they manufacture can operate at 3% -5% O2. For low NOx they imply a 6 to 1 turndown and the use of FGR to achieve this goal.

This boiler is the only one offered that I found that could meet the proposed requirements.
Are there any other boiler manufactures offering equipment that meet the proposed rule?

**4.) Subject Not Mentioned Low NOx!**

I believed I found one reference to low NOx in the 173-page report.
This is extremely odd as California has 36 different air districts and has the most stringent NOx regulations in the world.

Some districts require NOx emissions to be as low as 5-7 ppm on 2-10 MM BTUH boilers.

Achieving 5 or 7ppm while holding O2 very low is extremely difficult at the least. Parker has been working on Low NOx technologies since 1988 and we have not seen any boiler actually achieve these levels. We have reached out to a number of burner companies & Boiler service companies.

None of these company's Power Flame Burner, Webster Burner, ST Johnson Burner, Riello Burner, Weishaupt Burner, Limpsfield Burner, Bekaert Corporation (Burner Company), Alzeta Burner, San Jose Boiler, Johnson Boiler and Control, Porter Boiler Service, Moehlman Boiler knows about this stringent requirement or any boiler that can achieve it.

Another odd thing is the report is written with an understanding of combustion, excess air in the flue gas, stack temperature, and efficiency. So an understanding of combustion is apparent yet many of the statements made seem to not consider the market, the hourly rate paid to a Boiler Technician, the real world capacity factor of such equipment, the dangers of FGR among other things.

**5.) Feasibility Concern**

We are not aware of any or seen any boilers meeting these requirements. Perhaps Cleaver Brooks does have some. If they do our hat is off to them. However, before the SCAQMD established NOx requirements on these large boilers the boilers were vetted. There was one occasion in the SCAQMD in the past where a 5 ppm NOx rule was put into place while the technology was extremely complex installed on one boiler and subject to breakage and the cost of the equipment was 5 to 10 times more than other similar sized boilers. After a series of complaints and reviews the 5 ppm NOx rule was resend and the required NOx level was raised.
In future rulemaking in the SCAQMD boilers setting the standard were source tested then randomly tested by independent operators thus showing real compliance. They did not just take a manufactures word and product literature claims.
Can you please present some data relative to boilers actually running at less than 3% O2 while meeting the 5 or 7 ppm NOx rule as required by the local air district?

A CEC study prepared by Alex was completed in 2018 titled "Near-Zero NOx Burner" in this study apparently funded by the state the conclusion was they could **not** meet 3% O2 while achieving these low NOx levels. They also used FGR and experience limitations with FGR.
I wish to point out that FGR use on a burner can make the boiler and burner unstable and dangerous. On the burners such as those used by CB the flame setup and stability is usually very touchy.
When gas, air and FGR ratios get off balance which they can the boiler can shake and rock and roll and it is uncomfortable to be near.

Now much of the current technology on boilers used to meet the NOx requirements in California entails the use of metal fiber mesh type burners, these must run at O2's higher than 3% to achieve the low NOx numbers.

**6.) Energy Use and Capacity Profile concern**
We are concerned that the requirement to use a high mass boiler high furnace pressure boiler will actually lead to more energy use for process boilers in many instances.

The reason for this is because boilers in their size category used for process applications are often either started & stopped daily, or a few times per week or seasonally. We are familiar with many process boiler applications and the process in most cases is not continuous. Many process applications require the boiler be sized for a startup load then it coasts along maintaining the process, essentially idling along.

The operating hours shown for your costing at 5333 hour/yr. (page 59) or a 60% load factor is just not really how boilers in our size category (up to 6.8 MM BTUH) operate.

Few boilers in the 5-10 MM BTUH are base loaded and running all the time, even hospital boilers typically run much less than ½ the time. At all hospitals there must be a 100% standby boiler(s) which are sized for winter so it is easy to conclude the boiler could not run more than half the time and not even that as the summer load will be reduced.

Although DOE may state that a 60% load factor is appropriate it is not in California.

Perhaps in the 1960's and 70's this might have been closer to the actual figure, however California has experienced an extreme out flow of these process boilers to China (burning coal or oil), Mexico and other states and countries.

The fact Elon Musk, Hewlett Packard, & Oracle all are moving out of California now is evidence of this as the heavy manufactures in California started moving long ago.

I have been observing boilers running in process applications for 41 years we have been selling boiler lead lag systems for 41 years also and understand load profiles. We are providing load profiles for some process boilers as evidence. Please see attached. These load profiles come from some process boiler sites which we monitor process loads and boilers running via a cellular link.

In terms of energy use we believe that if users are limited and can only purchase a high mass boiler that significant energy will be wasted due to startup loads.
Let's compare a high mass boiler to a water tube type in regards to starting up:

The 150HP CBEX Boiler as cataloged is a very large mass boiler. It contains of 8,010 pounds of water. For comparison purposes a 150HP water tube boiler may contain approximately 2,100 pounds.

The following is the energy consumed upon cold start-up;

**CBEX 150HP**

- Mass 8,010 lbs. of water, specific heat 1.0, enthalpy cold = 28 BTU/LB
- Enthalpy @ 100 PSI steam pressure =1189 BTU/LB
- Cold start BTU'S = 8,010 x 1.0 x (1189 – 28) = 9,299,610

**Water Tube Typical 150Hp Boiler**

- Cold start BTU'S = 2,100 x 1.0 x (1189 – 28) = 2,438,000
- Difference = 6,861,610 BTU'S
- Fuel required at 82% efficiency = **8,367,817 BTU**
- **(Over 1 Hour of high five burn wasted)**

This is substantial about of gas burned, GHG emissions & cost for every boiler start up.

It is true that if the boiler is turned off one day the enthalpy of the boiler water might not go down to 28 for the next start up. However, heat will be lost on shutdowns and there will always be extra energy used to start the firetube high mass boiler up as compared to a water tube.

In the state of California, a boiler attendant is required while a high-pressure steam boiler is in operation so it is extremely costly to leave the boiler on to avoid the energy loss of a shut down.

Perhaps boilers in larger size ranges are left on (requiring attendance), but we can tell you that it is cost effective to turn water tube boilers off when you can from a maintenance & energy perspective. Why burden the user of a boiler with such a high startup load when the boiler use is sporadic not daily. This is wasteful.

Also the CB design is a design which has a high furnace pressure, more so than a typical water tube boiler. This means more fan electrical power is consumed.

**7.) Cost Analysis Data Hourly Rate (page 94)**

In addition to the capacity factor for hours of operation being wrong, the labor rate at $100/hr. to work on a boiler with O2 trim is not correct. Where did that come from? Our service rate for such work is $168 and in the bay area rates are closer to $200 per hour. I just checked in on a Kentucky service company and their rate is $160 per hour.

We feel the labor hours at 4 & 8 on page 94 are not realistic for boilers of this size range as some air districts require multiple tune ups per year.

**8.) 90% Exemption For Process Boilers**

This requirement does not make sense to me in that the report writers seem to understand the efficiency as it relates to stack temperature, O2 levels, excess air & return water temperature (or make up water)

however, a process boiler may operate at return (or boiler inlet temperatures) significantly higher than 120 or 130°F required for 90% efficiency and condensing operation.

Parker Boiler manufactures process steam boilers and high temperature hot water boilers also. These are used in a variety of process environments. Some of these hot water boilers operate with return water temperature to the boiler over 275- 300°F. This is due to the process requiring higher temperatures to achieve the goal.

It is impossible to achieve condensing boiler efficiency with such a system.

A steam plant may be running at say 100PSI (337°F) and it maybe that the system requires very little make up water. In these cases, there is no way to reduce flue gas temperature down to condensing range based on steam temperature & hot boiler feed water.

If the steam plant with 100psi steam lost 100% of the steam to the process so there was no condensate return then high amounts of 60-70° F make up water would be available to cool the flue gas so condensation & higher efficiencies could be achieved.

We believe the proposal to require a 90% efficiency is just not an achievable option on some high temperature jobs.

These systems are not like space and water heating systems they are niche systems requiring special design and consideration. The designers of course must chose the proper equipment and integrate it to the process goals. It is not like you can throw a blanket over all these systems as they are unique.

We urge you to leave the efficiency for exemption at 85% at least; this would exceed the 82% figure that you have used in the calculations for the high mass boiler. Or perhaps require the flue gas temperature be within so many degrees (50F for instance) of the inlet temperature to the process boiler. We have seen some proposals like this from air districts.

We believe the proposal of just requiring 90% does not consider all elements of the issue and closes the door to energy savings in some instances which is the goal.

**SUMMARY**

We look forward to receiving a response to the questions asked in this letter. And for the writers to consider the points we have brought up. We would very much appreciate the opportunity to have a dialog and discussion. We feel the report was written without the proper outreach to the boiler community as evidenced to the large number of people I contacted who had no knowledge of this proposal. We should all be concerned with the lack of choices of boilers to comply with this rule as it makes one wonder about the code writing process and the real world energy use that may increase based on limited choice.

Yours truly:
Greg Danenhauer
Greg Danenhauer
Parker Boiler Co.
Vice President Engineering
State of California Registered Professional Engineer M-21981
ASHRAE Life Member
ASPE Member
Working Group Committee, SCAQMD Rules 1146.2, 1146.1, 1146, 1121

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January 20, 2021

# Load Profiles

Following are the load profiles of actual process boilers running in real time for the time periods indicated.

**1.) Battle Creek VA -Process Steam less Laundry**
As you can see from the 7 day & 24 hour views the boilers are started about 3 in the morning and shut off about noon. So, it appears these boilers start about 5 times per weeks & the fluid temperature drops to under 100°F.

**2.) Little Rock VA -Process Steam less Laundry**
As you can see from the 7-day & 24 hour views the boilers are started about 3 in the morning and shut off about noon. So, it appears these boilers start about 5 times per weeks & the fluid temperature drops to under 100°F.

**3.) Seismic -Food / Drink Process**
As you can see from 7-day & 24 hour views the boilers seem to be started daily on weekdays and the daily hourly use of the boiler likely depends on product demand.

**4.) Spica - Process to Make Varnish**
As you can see form the 7 day & 24 hour views the boiler is started perhaps 1-3 times per week.

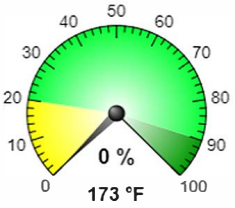
PARKER INDUSTRIAL BOILER


MAIN | ALARM HISTORY | MOBILE | LOCKOUT CODES

**CURRENT ALARMS**

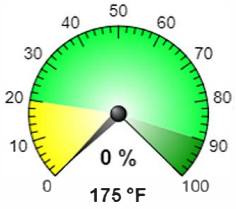
| Status: | Name: | Fire time: | Reset time: |
|---|---|---|---|

**BOILER 1**



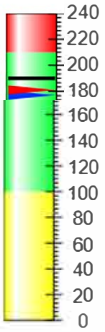

LEAD BOILER

**BOILER 2**

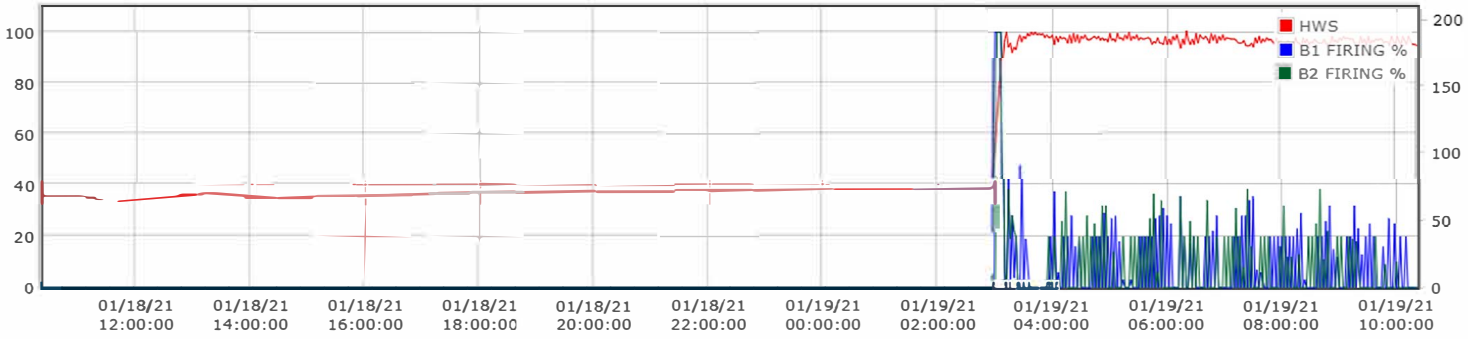



**SYSTEM**

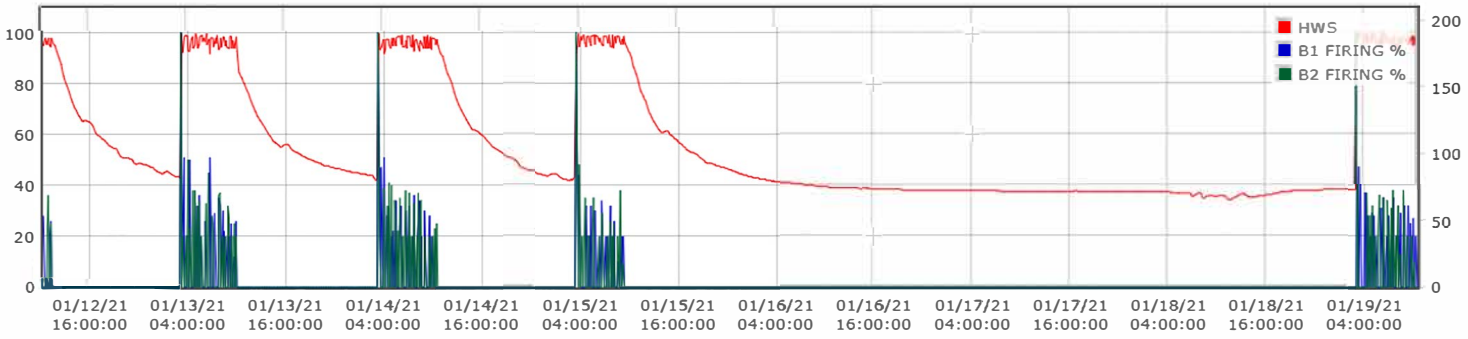
| | |
|---|---|
| Setpoint: | 190 °F |
| HWS: | 181 °F |
| HWR: | 177 °F |


**24 HOUR VIEW**




**7 DAY VIEW**



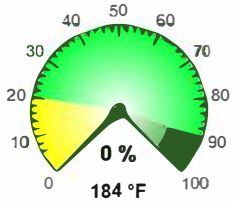
PARKER INDUSTRIAL BOILER


MAIN | ALARM HISTORY | MOBILE | LOCKOUT CODES

**CURRENT ALARMS**

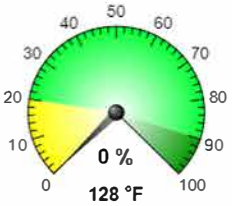
| Status: | Name: | Fire time: | Reset time: |
|---|---|---|---|

**BOILER 1**




LEAD BOILER

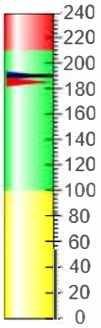
**BOILER 2**



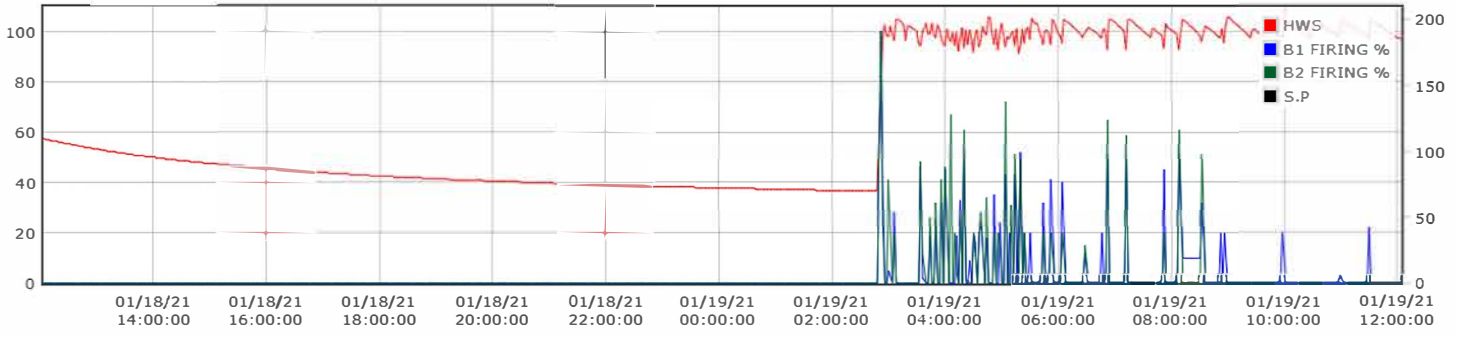

**SYSTEM**

| | |
|---|---|
| Setpoint: | 190 °F |
| HWS: | 185 °F |
| HWR: | 190 °F |

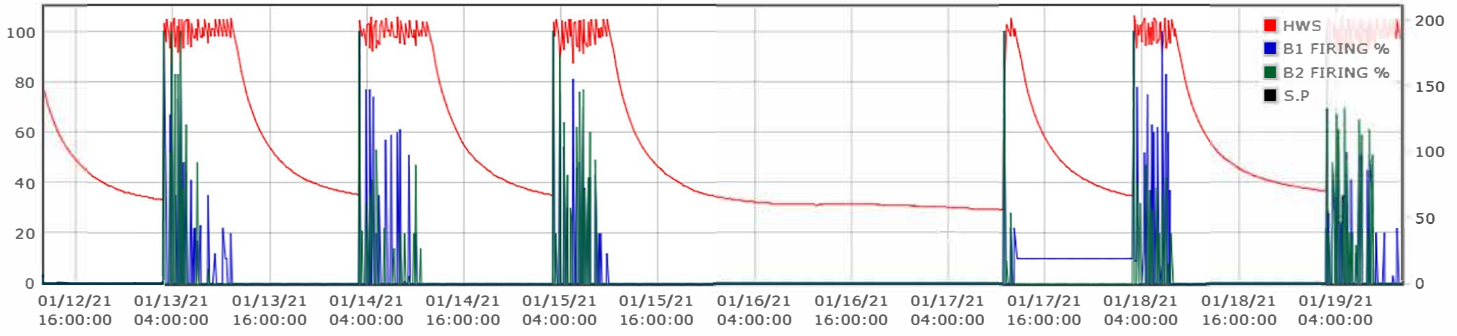
OFF



## 24 HOUR VIEW



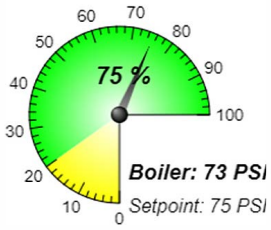

## 7 DAY VIEW



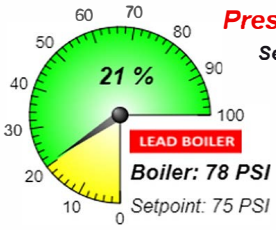
PARKER INDUSTRIAL BOILER

MAIN | ALARM HISTORY | CONTACT US

**BOILER 1**



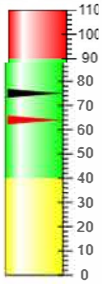

**BOILER 2**




**SYSTEM**

Pressure: 64 PSI

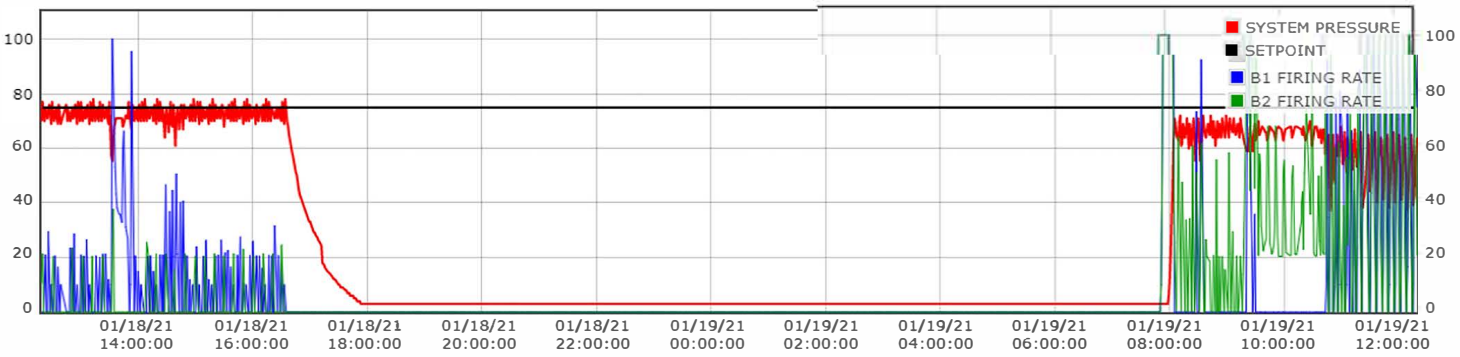
Setpoint: 75 PSI



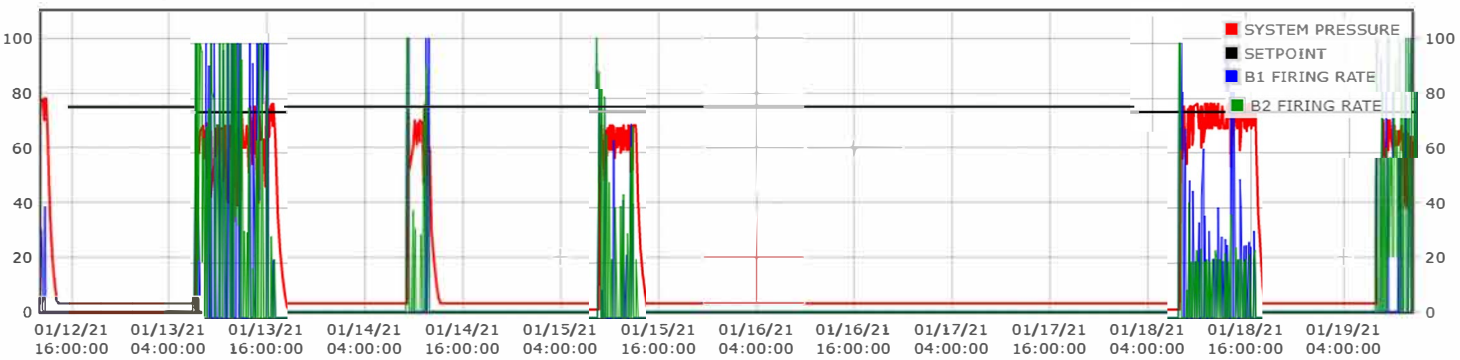
**Current Alarms**

| Status: | Name: | Fire time: | Reset time: |
|---|---|---|---|

**24 HOUR VIEW**




**7 DAY VIEW**



PARKER INDUSTRIAL BOILER

SICPA

Main | Alarm History | Contact Us

**SYSTEM**

Setpoint: 285 °C

THERMAL SUPPLY: 271 °C

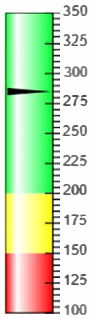
THERMAL RETURN: 267 °C

SYSTEM PRESSURE: 56 PSI

**HEATER**


FIRING: 100 %

ON




**HEATER PUMP 1**

**HEATER PUMP 2** LEAD PUMP

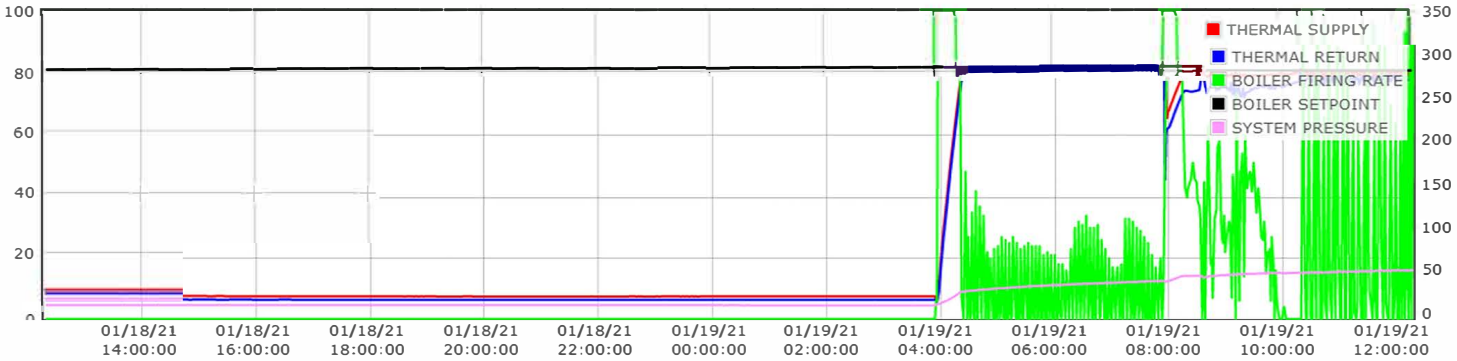
**SYSTEM PUMP 1** LEAD PUMP

**SYSTEM PUMP 2**

*ACTIVE ALARMS*

| Status: | Name: | Fire time: | Reset time: |
|---|---|---|---|

*24 HOUR VIEW*




*7 DAY VIEW*