Serving *all of* California

24/7 EMERGENCY SERVICE: 800-8-LOW-NOX

50 YEARS / 50 EFFICIENCY TIPS

#	Subsystem	Action	Description	Difficulty	ROI
1	Boiler/Burner/Combustion	Upgrade to a High-Turndown Burner	Replace your existing burner with a high-turndown model (e.g., 10:1) to better match plant load, reduce cycling, and minimize purge-related energy losses. This can improve fuel efficiency by 10-15% in facilities with variable loads.	High	High
2	Boiler/Burner/Combustion	Install Parallel Positioning Controls	Retrofit your boiler with parallel positioning controls to replace mechanical linkages. This provides precise, independent control of the fuel and air, optimizing the air-to-fuel ratio and improving combustion efficiency by 2-5%.	Medium	High
3	Boiler/Burner/Combustion	Implement an Oxygen (O2) Trim System	Install an O2 trim system to continuously analyze flue gases and automatically adjust the air-to-fuel ratio. This ensures the boiler operates at peak efficiency, saving 1-3% on fuel by compensating for changing atmospheric conditions.	Medium	High
4	Boiler/Burner/Combustion	Perform Regular Burner Tune-Ups	Have a qualified technician perform a full combustion analysis and tune-up on your boiler at least twice a year. Best times are Summer & Winter. A well-tuned boiler can improve efficiency by 1-2% and ensure safe, reliable operation.	Low	High
5	Boiler/Burner/Combustion	Clean Mesh Burner, Diffuser and Internals	Regularly inspect and clean Mesh Type burners, diffuser and other internal components to ensure proper flame shape and stability. A clean burner promotes more complete combustion and prevents the formation of soot and CO.	Low	Medium
6	Boiler/Burner/Combustion	Inspect and Clean Flame Scanner	Regularly clean the flame scanner lens to ensure it has a clear view of the flame. A dirty scanner can cause nuisance shutdowns and prevent the boiler from operating reliably.	Low	Medium
7	Boiler/Burner/Combustion	Consider a Full Boiler Replacement	If your boiler is old and inefficient, consider replacing it with a new, high-efficiency model. Modern boilers can be 10-15% more efficient than older designs, leading to significant long-term fuel savings.	High	Medium
8	Boiler/Burner/Combustion	Evaluate Alternative Fuel Capabilities	Investigate the possibility of retrofitting your burner to burn a less expensive alternative fuel, such as landfill gas or digester gas. This can significantly reduce fuel costs and may be supported by utility incentives.	High	Medium
9	Boiler/Burner/Combustion	Upgrade Operating Controls	Replace outdated operating, modulating, and high-limit controls with modern, more accurate electronic controls. This prevents overshoot and undershoot of the desired pressure or temperature, saving energy and improving process control.	Medium	Medium
10	Boiler/Burner/Combustion	Clean Fireside Surfaces	Regularly clean the fireside surfaces of the boiler to remove soot and scale buildup. A 1/8-inch layer of soot can increase fuel consumption by as much as 8%, so keeping these surfaces clean is critical for maintaining high efficiency.	Medium	High
11	Boiler/Burner/Combustion	Upgrade to a Modular or Condensing Boiler System	Replace an older, oversized boiler with a modular boiler system or a condensing boiler designed to extract maximum heat from flue gases. Modular systems allow for better load matching and reduce cycling losses, while condensing boilers can achieve efficiencies of 95%+ by recovering latent heat. This is a significant capital investment but can deliver 10-20% fuel savings in the right applications.	High	High

12	Heat Recovery	Install a Feedwater Economizer	Install a feedwater economizer to capture waste heat from the flue gas and use it to preheat the boiler feedwater. This can reduce fuel consumption by 5-10% and typically has a payback period of less than two years.	High	High
13	Heat Recovery	Add a Condensing Economizer	If you have a large, cold makeup water load, a condensing economizer can recover both sensible and latent heat from the flue gas, improving efficiency by up to 10%. This is particularly effective for natural gas-fired boilers.	High	High
14	Heat Recovery	Install a Blowdown Heat Recovery System	Recover the heat from the hot, high-pressure blowdown water by using it to preheat the makeup water. This can recover up to 90% of the energy that would otherwise be lost to the drain.	Medium	High
15	Heat Recovery	Use a Flash Steam Vessel	Install a flash steam vessel to recover low-pressure steam from the continuous blowdown. This flash steam can be used to supplement the deaerator or for other low-pressure steam demands, saving energy and reducing makeup water requirements.	Medium	High
16	Heat Recovery	Install an Automatic Stack Damper	Install an automatic stack damper to prevent heat from escaping up the chimney during the boiler's off cycles. This reduces standby losses and can save 1-3% on fuel, especially for boilers that cycle frequently.	Medium	Medium
17	Heat Recovery	Evaluate Waste Heat for Process Use	Analyze your facility for opportunities to use waste heat from the boiler flue gas for other process needs, such as heating domestic hot water or preheating combustion air. This can provide an additional layer of energy savings.	High	Medium
18	Heat Recovery	Recover Heat from Condensate	Ensure that all hot condensate is returned to the boiler feedwater system. For every 10°F increase in feedwater temperature, you can save approximately 1% on fuel.	Low	High
19	Feedwater & Blowdown	Optimize Surface Blowdown Rate	Regularly test the boiler water TDS and adjust the continuous blowdown rate to the minimum level required to maintain proper water chemistry. Excessive blowdown wastes energy, water, and chemicals.	Low	High
20	Feedwater & Blowdown	Automate Blowdown Control	Install an automatic blowdown control system that continuously monitors the boiler water conductivity and adjusts the blowdown rate automatically. This ensures the blowdown rate is always optimized, saving energy and reducing operator oversight.	Medium	High
21	Feedwater & Blowdown	Perform Bottom Blowdowns Regularly	Manually perform bottom blowdowns at least once per shift to remove sludge and sediment from the bottom of the boiler. This improves heat transfer and prevents the formation of insulating deposits.	Low	Medium
22	Feedwater & Blowdown	Maintain Deaerator Temperature and Pressure	Ensure your deaerator is operating at the proper temperature and pressure (typically 227-250°F and 5-15 psig) to effectively remove dissolved oxygen from the feedwater. This prevents corrosion and improves boiler efficiency.	Low	High
23	Feedwater & Blowdown	Upgrade to a High-Efficiency Deaerator	If your deaerator is old or undersized, consider replacing it with a new, high-efficiency model. Modern deaerators can reduce oxygen levels to as low as 7 ppb, minimizing corrosion and improving long-term reliability.	High	Medium
24	Feedwater & Blowdown	Implement a Robust Water Treatment Program	Work with a qualified water treatment specialist to develop and maintain a comprehensive water treatment program. Proper water chemistry is essential for preventing scale and corrosion, which can significantly degrade boiler efficiency.	Medium	High
25	Feedwater & Blowdown	Monitor Makeup Water Usage	Install a meter on the makeup water line to track the amount of water being used. A sudden increase in makeup water usage can indicate a leak in the system or a large number of failed steam traps.	Low	Medium

26	Controls & Automation	Install Variable Frequency Drives (VFDs)	Install VFDs on large motor loads, such as combustion air fans and feedwater pumps. This allows the motor speed to be matched to the load, saving significant electrical energy, especially at partial load.	Medium	High
27	Controls & Automation	Implement Boiler Sequencing Controls	For multiple-boiler plants, install a sequencing control system to optimize which boilers are running and at what load. This prevents inefficient operation of multiple boilers at low loads and can save 5-15% on fuel.	Medium	High
28	Controls & Automation	Upgrade to a PLC-Based Control System	Replace outdated relay-based controls with a modern PLC-based system for more reliable and flexible operation. A PLC can provide more advanced control strategies, improved data logging, and easier integration with other systems.	High	Medium
29	Controls & Automation	Integrate with a Building Management System (BMS)	Connect your boiler controls to a plant-wide BMS for centralized monitoring and control. This allows for better coordination of energy use across the entire facility and can unlock additional savings opportunities.	Medium	Medium
30	Controls & Automation	Install an Automatic Draft Control System	Install a system to automatically control the furnace draft. This provides more stable combustion, improves efficiency, and prevents pressure fluctuations in the boiler.	Medium	Medium
31	Controls & Automation	Use Feedforward Control for Steam Pressure	Implement a feedforward control strategy that anticipates changes in steam demand. This allows the boiler to respond more quickly to load changes, improving steam pressure stability and process control.	High	Medium
32	Controls & Automation	Install Steam Flow Meters	Install flow meters on main steam lines to accurately measure and track steam production and consumption. This data is essential for identifying areas of high energy use and for tracking the effectiveness of efficiency projects.	Medium	Medium
33	Controls & Automation	Implement a Data Acquisition System	Use a data acquisition system to continuously monitor and log key boiler performance parameters, such as fuel flow, steam flow, flue gas temperature, and O2 levels. This data can be used to identify trends, troubleshoot problems, and optimize performance.	Medium	Medium
34	Controls & Automation	Enable Remote Monitoring and Control	Implement a system that allows for remote monitoring and control of the boiler plant. This can improve operator efficiency, reduce response times to alarms, and provide experts with remote access for troubleshooting.	Medium	Low
35	Steam Distribution & Traps	Conduct Regular Steam Trap Surveys	Implement a program to test all steam traps in your facility at least annually. A single failed-open trap can waste thousands of dollars in steam energy each year, and failure rates of 15-30% are common in unmaintained systems.	Medium	High
36	Steam Distribution & Traps	Repair or Replace Failed Steam Traps Immediately	Once a failed steam trap is identified, prioritize its repair or replacement. The energy savings from fixing a single failed trap can often pay for the cost of the repair in just a few months.	Low	High
37	Steam Distribution & Traps	Standardize Steam Trap Models	Where possible, standardize on a limited number of steam trap models for different applications. This simplifies maintenance, reduces spare parts inventory, and makes it easier for technicians to become experts in their repair.	Low	Low
38	Steam Distribution & Traps	Install a Steam Trap Monitoring System	For critical or hard-to-reach traps, consider installing a wireless monitoring system. These systems provide real-time data on trap performance, allowing you to identify failures instantly and avoid prolonged energy losses.	Medium	Medium
39	Steam Distribution & Traps	Ensure Proper Steam Piping Design	Review your steam piping to ensure it is properly sloped and has adequate drip legs to remove condensate. Proper design prevents water hammer, improves steam quality, and ensures efficient operation of steam-using equipment.	High	Medium

40	Steam Distribution & Traps	Repair Steam Leaks	Regularly walk through your facility to listen for and visually identify steam leaks. Even a small leak can waste a significant amount of energy and money over the course of a year.	Low	High
41	Steam Distribution & Traps	Check for and Repair Water Hammer	Investigate any instances of water hammer in your steam system. Water hammer is a sign of condensate in the steam lines and can cause serious damage to piping, valves, and equipment.	Medium	Medium
42	Insulation & Maintenance	Insulate All Steam and Condensate Lines	Ensure that all steam and condensate piping is properly insulated. Uninsulated steam lines can lose a significant amount of heat to the surrounding air, wasting energy and creating a safety hazard.	Medium	High
43	Insulation & Maintenance	Insulate Valves, Flanges, and Other Components	Don't forget to insulate valves, flanges, and other components in the steam system. Removable insulation jackets are available for these components, making them easy to insulate and access for maintenance.	Low	High
44	Insulation & Maintenance	Regularly Inspect and Repair Insulation	Walk through your facility at least annually to inspect the condition of the insulation on all steam and condensate lines. Repair or replace any damaged or missing insulation to prevent unnecessary heat loss.	Low	High
45	Insulation & Maintenance	Clean Waterside Surfaces	Regularly inspect and clean the waterside surfaces of the boiler to remove scale deposits. A thin layer of scale can significantly reduce heat transfer and lower boiler efficiency.	Medium	High
46	Insulation & Maintenance	Calibrate All Instruments and Controls	Regularly calibrate all instruments, transmitters, and controls on the boiler to ensure they are reading accurately. Inaccurate readings can lead to inefficient operation and unsafe conditions.	Low	Medium
47	Insulation & Maintenance	Check and Maintain All Safety Devices	Regularly test and maintain all safety devices on the boiler, including safety valves, low water cutoffs, and high-pressure switches. This is essential for ensuring the safe and reliable operation of the boiler.	Low	Medium
48	Insulation & Maintenance	Maintain a Daily Boiler Log	Have your operators maintain a daily log of key boiler operating parameters. This can help to identify trends, predict problems, and track the effectiveness of efficiency improvements.	Low	Low
49	Insulation & Maintenance	Provide Ongoing Operator Training	Invest in ongoing training for your boiler operators to ensure they are up-to-date on the latest best practices for efficient and safe boiler operation. Well-trained operators can have a significant impact on the overall efficiency of the boiler plant.	Medium	Medium
50	Insulation & Maintenance	Develop a Proactive Maintenance Plan	Work with your team to develop a proactive maintenance plan for the entire steam system. This should include regular inspections, preventive maintenance tasks, and a plan for addressing any issues that are identified.	Medium	High