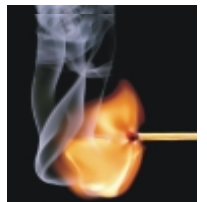
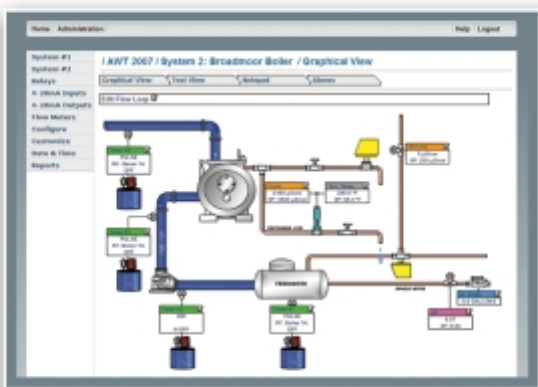




Boiler Blowdown System

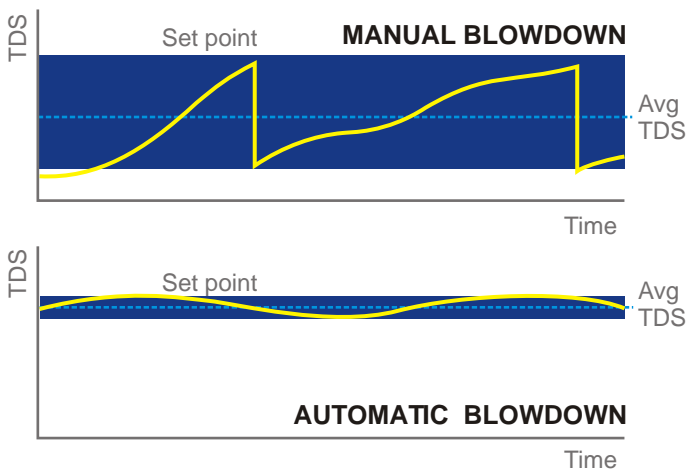


Recover energy from
Boiler Blowdown...

MANUAL VS. AUTOMATIC BLOWDOWN

Blowdown is achieved either by manual or automatic methods. In the manual method, blowdown is achieved by opening a large bore valve at the bottom of the drum (or on the side of the drum in case of continuous blowdown). However, this practice can be highly wasteful. As the period of blowdown is not related with either boiler steam load or feedwater purity, the TDS level in manual methods can vary greatly, causing an average TDS level much lower than the allowable limit, leading to excess blowdown and huge heat losses.

On the other hand, an automatic blowdown control system, based on TDS measurement and subsequent corrective action, can maintain a TDS level much closer to the set point, resulting in considerable fuel savings.



As seen in the graphs above, the automatic control of TDS results in an average TDS level much closer to the set point. This means that the actual quantity of blowdown over a period of time gets reduced compared to the manual method.

KEY BENEFITS OF AUTOMATIC BLOWDOWN OVER MANUAL BLOWDOWN

- ▶ Much better setpoint control as compared to manual blowdown systems
- ▶ Results in energy savings which directly translates to fuel savings
- ▶ Prevention of corrosion in the boiler and steam system



The Automatic Boiler Blowdown Controller represents the latest in technological and innovative advancements from ARI Steamline.

All of the standard features you'd expect in conventional boiler controllers/condensate monitors are included, plus optional simple-to-use information management tools that enable water treatment professionals to deliver more effective service to their customers.

The ARI Steamline BBS controllers have the ability to store conductivity and temperature values, water usage, relay status, and user settings.

UNDERSTANDING BLOWDOWN

Inside a boiler

Water that is fit for human consumption is not necessarily fit for a boiler. Boiler water contains many dissolved solids both from raw water and water treatment chemicals that lead to "hardening". As steam is raised from a boiler, the concentration of Total Dissolved Solids (TDS) in the boiler water increases. This leads to scale deposits on the tube surfaces resulting in reduced heat transfer. This means increased fuel consumption and decreased boiler efficiency, as well as corrosion. Thus we need to accurately control the TDS levels in a boiler. We do that by "blowing down" some of the high concentration water. As level controls add more freshwater to maintain boiler water level, salt concentration drops.

What is Blowdown ?

Blowdown of steam boilers is very often a highly neglected or abused aspect of routine boiler room maintenance. Very simply put, blowdown is the process by which water in the boiler is periodically emptied in order to prevent the TDS levels from overshooting the desired limit. Blowdown, therefore, protects boiler surfaces from severe scaling or corrosion problems that can result otherwise.

TDS Control

In order to prevent the problems of scale deposits, corrosion, reduced heat transfers and reduced boiler efficiency, the TDS needs to be controlled within a certain specified maximum limit.

The dissolved solids, ppm level is recommended to be 3500 ppm (parts per million) for most boilers. (See the water characteristics table below).

This is the Set point of TDS that no boiler should be allowed to across because of scale, foam and carryover problems.

Boiler Water Limits for boilers up to 25 bar g

Total Hardness, mg/lit	Not detectable
Sodium Phosphate, mg/lit Na ₃ PO ₄	50 - 100
Total Alkalinity, mg/lit	1200
Suspended Solids, mg/lit	50
Dissolved Solids, PPM	3500

Reference - IS: 10392-1982 and BS: 2486-1964 standard

Automation of Continuous Blowdown Using Steamline's Automatic Boiler Blowdown System Yields Big Rupee Savings

SAVINGS WITH AUTOMATIC CONTROL

System: One boiler, used for heat and process, generating 12 tons of steam per Hour at boiler with twice a day of steam per day at 10.5 kg/cm²g, with a 30% return of condensate; make-up water at 100 ppm TDS (Total dissolved Solids).

Before Automation: Manual control of intermittent bottom blowdown achieving only 2 cycles of concentration, with poor control. Operator is forced to keep blowdown excessive to prevent scale deposition.

After Automation: Operating under good control at 15 cycles of concentration. Blowdown reduced by 2053 kgs/day daily; make-up water requirement reduced by 2053 kgs daily.

1. Energy cost of excessive blowdown

The boiler can be safely operated nearer to the upper limit of TDS recommended by your water treatment expert. No matter how attentive the operator, manual control of blowdown subjects the boiler to wide swings in water quality, in order to stay safely below the upper limit (and protect against waterside deposits), manual control causes excessive blowdown.

Rs. 662 / day

2. Energy losses due to scale deposition

Not Quantifiable

3. Labour reqd for testing/ blowdown adj

Because the blowdown operation is now automatic, the operator no longer has to make daily (or more frequent) tests of boiler water and consequent adjustments.

Not Quantifiable

4. Water and Chemical Savings

Under automation, excessive blowdown is eliminated and therefore less makeup water is consumed, and less waste water is put to the sewer.

Rs. 205 / day

Because make-up water requirements are lessened, the use of treatment chemicals is proportionally reduced. Similarly, the cost of fuel treatment is reduced due to lower fuel consumption.

Savings per day

Assume the plant works 350 days a year.

Rs. 867 / day

Total Annual Savings Rs. 3,03,450

The Boiler TDS Controller chosen for this application would be the NanoTron model. It would be supplied with a boiler TDS electrode. The cost would be Rs. 1,55,000, which would be recovered in 6.2 months.

The additional benefit, besides the savings mentioned above, would be the safety of the correct TDS value being maintained, ensuring that no damage is caused to the boiler.

Calculation of Energy cost of excessive blowdown

- A. Intermittent blowdown flowrate
 = time of blowdown (secs) X blowdown flowrate (kg/sec) X no. of blows/shift
 = 75 X 11 X 2 = 1650 kgs/shift = 4950 kg/day
- B. Required blowdown flowrate
 = $\frac{\text{avg steam generation per hour} \times 24 \times \text{feedwater TDS}}{\text{(Required boiler water TDS - feedwater TDS)}}$
 = $\frac{3500 \times 24 \times 100}{(3000 - 100)}$ = 2896 kg/day
- C. Reduction in blowdown qty possible (A - B) = 2053 kg/day
- D. Savings in monetary terms
 = $\frac{\text{Reduction in blowdown} \times \text{heat in water} \times \text{fuel cost}}{\text{GCV of fuel} \times \text{boiler efficiency}}$
 = $\frac{2053 \times (187 - 90) \times 28}{10200 \times 0.86 \times 0.96}$ = **Rs 662 / day**

Calculation of Water and Chemical costs

- Savings in water treatment cost
 = reduction in blowdown qty (C above) X treated water cost
 = 2053 X 0.1 = **Rs. 205 / day**

KEY BENEFITS OF THE ARI STEAMLINE BOILER BLOWDOWN SYSTEM

- ▶ The widest, most feature-rich range of TDS control systems for one, two or multiple boilers in a single sys
- ▶ Industrial grade TDS sensors
- ▶ Embedded controllers with Ethernet/Internet connectivity (Megatron)
- ▶ Blowdown heat recovery solutions
- ▶ IBR approved systems
- ▶ Automatic temperature compensation

**NanoTron TDS
Dual Relay Control**

Low cost Microprocessor Control of:

- Conductivity
- Configurable Feed Timer


Application

The NanoTron is a compact, dual relay microprocessor-based controller with many standard features. NanoTron models are available to control conductivity and one selectable feed timer, or two independently programmable feed timers.

The NanoTron platform provides an economical option for conductivity control of a small boiler, condensate contamination detection system, cooling tower, or other recirculating water system. Systems are supplied complete with Controller, Sensor, Control Valve (on-off), Isolating Valves and Interconnecting Piping, fully IBR certified, for a quick and easy installation.

KEY FEATURES OF Nano Tron TDS Dual Relay Control

- ✓ Compact Design
- ✓ Simple Step Through Menu
- ✓ IP65 (NEMA 4X) Style Enclosure
- ✓ Raised Dome Keypad
- ✓ Non-Volatile Memory
- ✓ Water Meter Totalizer
- ✓ 2 Year Warranty
- ✓ Available Flow Switch

Mega Tron SS

Complete Microprocessor Control of:

- Conductivity • Make-Up Conductivity
- pH • ORP • Temperature
- 4-20 mA Digital Inputs & Outputs
- Water Meter Inputs • PPM
- Chemical feed timers • Biocide Feed
- Service Reports • Aux Flowmeter Input
- Saturation Indexing • Service Reports
- LAN & Web based Control options


Application

MegaTronSS is designed for continuous monitoring of industrial water systems such as boilers, condensate quality monitors, cooling towers and process water. It can control a single loop with the most customization flexibility available. Each one of these systems can be configured to control a wide range of digital and analog inputs. Relay activation and names plus many other features are field selectable. The "Notepad" allows the input and history gathering of service report parameters.

Systems are supplied complete with Controller, TDS and Temperature Sensors, Control Valve (on-off), Isolating Valves and Interconnecting Piping, fully IBR certified, for a quick and easy installation. The Controller can be fitted with various option cards for Inputs, Outputs, LAN, Internet, Modbus, BACNet, etc. for plant-wide and even world-wide data monitoring and control.

KEY FEATURES OF MegaTron SS

- ✓ Customizable LCD Display
- ✓ On Board History Graphs
- ✓ Simple ATM Style Menu
- ✓ One Point Calibration
- ✓ Internet Communications Option
- ✓ 5 Assignable Relays
- ✓ Relay Test Keys
- ✓ Customizable Notepad
- ✓ Multi-Level Security Code
- ✓ 2 Year Replacement Warranty
- ✓ Email Alarm Capable
- ✓ PLC and SCADA compatible

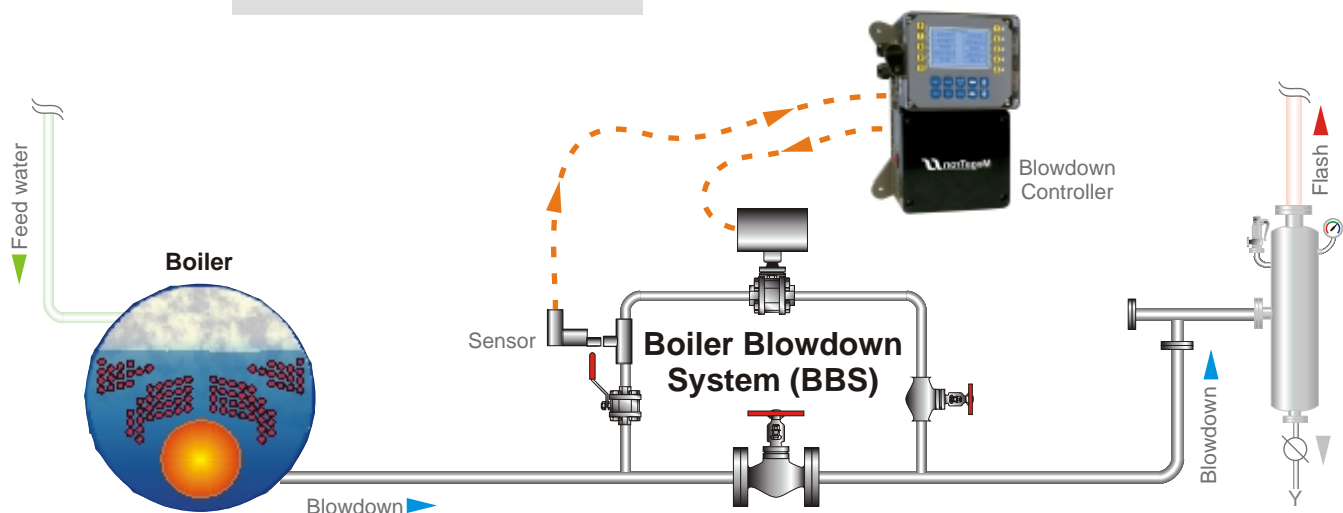
Water Treatment's
Most User Friendly,
Web Capable,
Controllers


**NanoTron Timer
Time-based Control**

Low cost Microprocessor Control for Time-based blowdown.

Application

The NanoTron Timer is our lowest cost system, featuring time-based blowdown for small boilers, where TDS monitoring may not be practical.



INPUTS

Power

95-240 VAC, 50/60 Hz, 12A

Signals

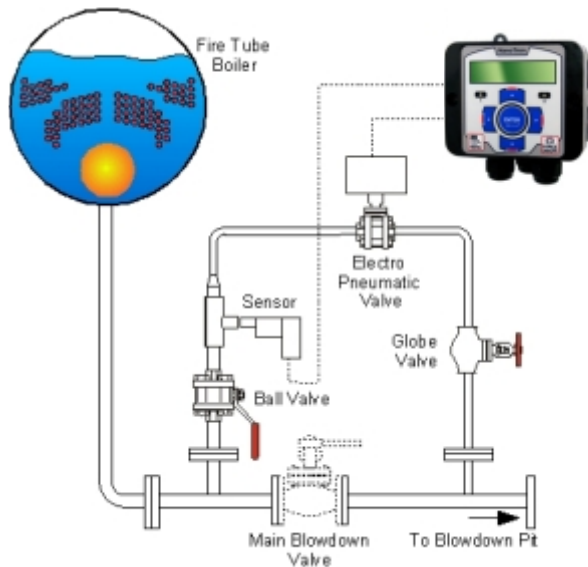
Cond Electrode: 1.0 cell factor
 10K thermistor
 Temperature electrode Pt-100 RTD

MEASUREMENT PERFORMANCE

Conductivity Range 0-10,000 $\mu\text{S}/\text{cm}$ (Nano 100 -5000)
 Display: 240 X 128 Graphic LCD (Nano 1x16)
 Resolution 1 μS
 Accuracy 10-10,000 $\mu\text{S}/\text{cm}$ $\pm 1\%$ of reading
 0-10 $\mu\text{S}/\text{cm}$ $\pm 20\%$ of reading
 Temperature Range 0 to 200°C
 Resolution 0.1° C
 Pressure Range 0 to 24 bar (Nano 0 to17 bar)
 Accuracy $\pm 1\%$ of reading

INSTALLATION OPTIONS

(a) Bottom Blowdown



MECHANICAL

Enclosure: Heavy-duty high impact thermoplastic with padlockable gasketed Lexan viewing door.
 IP Rating: IP65 (NEMA 4X)
 Ambient Temperature: -17 to 52°C
 Electrode Rating: 24 bar at 224°C (Nano 17 bar 204C)

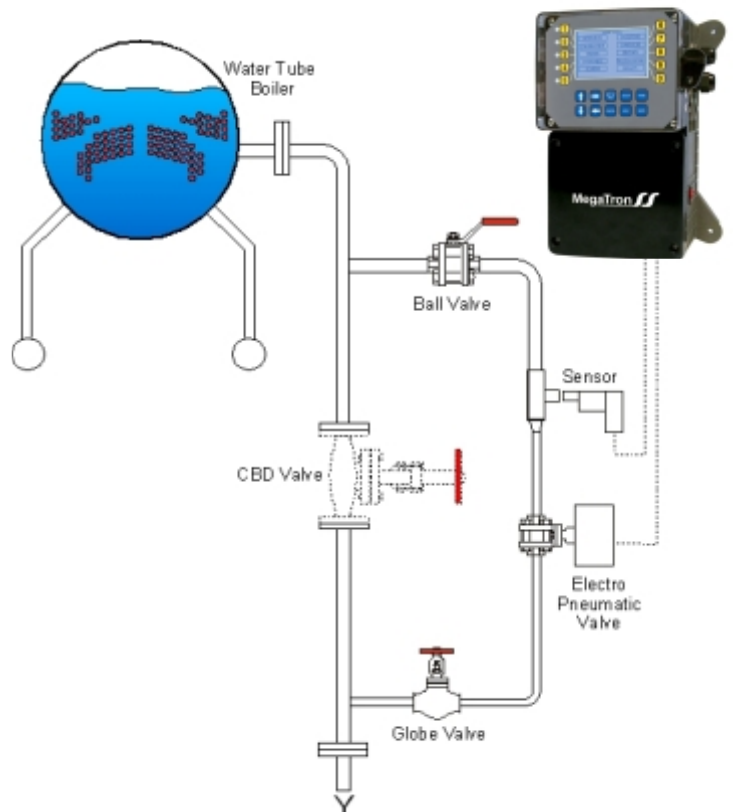
Dimensions: W 284 mm x H 305 mm x D 184 mm
 (Nano W 101.6 mm x H 108 mm x D 88.9 mm)

Shipping weight: 3.62 kg (Nano 0.91 kg approximately)

TDS PROBE DETAIL



(b) CBD / Surface Blowdown



Boiler Blowdown System (BBS)

Partial Reference List

No.	Company	Units	No.	Company	Units
1	Thermax Ltd, Pune	1	41	Thermax Ltd, Pune	3
2	Mahavir Spinning, Chandigarh	1	42	Thermax Ltd, Pune	1
3	Schmetz, Gujrat	1	43	Thermax Ltd, Pune	1
4	Cadbury India, Pune	1	44	Thermax Ltd, Pune	1
5	Wimco, Mumbai	2	45	Hindustan Coca Cola	2
6	Mahavir Spinning, Chandigarh	2	46	Goodyear, Aurangabad	1
7	Mahavir Spinning, Chandigarh	2	47	Thermax Ltd, Pune	4
8	Dynamix Dairy, Pune	5	48	Thermax Ltd, Pune	1
9	Thermax Ltd, Pune	1	49	UPL, Ankleshwar	1
10	Thermax Ltd, Pune	1	50	Thermax Ltd, Pune	1
11	Nestler Limited, Mumbai	2	51	Thermax Ltd, Pune	2
12	Fresenius Kabi, Pune	1	52	Thermax Ltd, Pune	1
13	Thermax Ltd, Pune	1	53	Thermax Ltd, Pune	1
14	Thermax Chemicals, Khopoli	2	54	UPL, Vapi	2
15	Intervet, Wagholi	1	55	Thermax Ltd, Pune	1
16	Thermax Ltd, Pune	2	56	Arti Industries, Vapi	1
17	Thermax Ltd, Pune	3	57	Thermax Ltd, Pune	2
18	Thermax Ltd, Pune	3	58	Thermax Ltd, Pune	2
19	Thermax Ltd, Pune	1			
20	Inventys Research Co., Mumbai	1			
21	Thermax Limited, Pune	3			
22	Cargill Foods India Ltd, Kurkumbh	2			
23	Thermax Limited, Pune	3			
24	Schreiber Dynamix Dairy, Baramati	1			
25	Serum Institute, Pune	2			
26	Serum Institute, Pune	1			
27	Serum Institute, Pune	2			
28	Sandvik Ltd, Mehsana	1			
29	Parag Milk Foods Pvt. Ltd, Pune	1			
30	Armstrong Utilities, Chennai	3			
31	Bodal Chemicals Ltd-VII, Gujarat	3			
32	Thermax India Ltd, Pune	2			
33	Thermax Ltd, Pune	2			
34	Thermax India Ltd, Pune	3			
35	Parag Milk Foods Pvt. Ltd, Pune	1			
36	Thermax Ltd, Pune	1			
37	Thermax Ltd, Pune	1			
38	Thermax Ltd, Pune	1			
39	Thermax Ltd, Pune	1			
40	Transpek Industry Ltd, Gujarat	1			

