

Thermax Condensate Recovery System

Thermax Condensate Recovery System

User Manual



1 Important Safety Instructions to the Users

- This manual presents information that will help to install, operate and maintain the equipment properly. It is expected that the contents be carefully read before handling the equipment.
- All safety instructions and warnings given in these mounting and operating instructions, particularly those concerning installation, start-up and maintenance, must be strictly observed.
- To ensure appropriate use, only use the TCRS in applications where the operating pressure and temperatures do not exceed the specifications used for sizing at the ordering stage.
- The manufacturer does not assume any responsibility for damage caused by external forces or any other external factors.
- Any hazards that could be caused in the TCRS by the process medium, operating pressure or by moving parts are to be prevented by taking appropriate precautions.
- A good installation is a permanent asset while a bad one can be a constant source of trouble. It can cost much more to correct a bad installation than to put a new one.
- The TCRS is a product of many years of knowledge, field experience & engineering effort, to provide long life & excellent service to the users. This unit will provide continued trouble-free service, if instructions on installation, operation and maintenance are properly followed.
- It is expected that the person involved in Installation, Operation & Maintenance possessing necessary qualification, competence, license & authority (if applicable) only, should handle the product. It is solely the responsibility of the equipment owner & user to ensure that all applicable statutory (if applicable) norms are adhered to during Installation, Operation & Maintenance of this equipment.
- The mechanical devices supplied as a part of the unit are chosen because of their known ability to perform, with proper operating techniques and maintenance procedures. Tampering with the safeties & controls or bypassing any of these is not permissible at any time.
- Any "Automatic" features included in the design do not relieve the attendant of any responsibility. Such features may free him of certain

- repetitive chores and give him more time to devote to the proper upkeep of the equipment.
- No amount of written communication can replace intelligent thinking & reasoning.

The following symbols/terms have been used in this manual at the end of some chapters for the attention of the users:



This is a symbol of "warning" to the equipment user & provides information about practices or circumstances that should never be allowed as can lead to personal injury or death, property damage, or economic loss.



This symbol is for hot surface areas where there is chance of temperatures above ambient temperatures which causes injuries.



This symbol is to avoid hand/fingers getting crushed with the flange joints/pipes.



Avoid injuries while working in steam leaking areas.



This is a symbol of "Caution" to the equipment user & provides information about the care to be taken on the actions or procedures which if not performed correctly, may lead to personal injury or incorrect function of the instrument or connected equipment.



Recommended Action

2 Abstract

Thank you for choosing sustainable solutions in energy and environment which help in conserving resources and preserving the future. This manual describes the principle of operation, instructions for installation, operation & maintenance of Thermax Condensate Recovery System (TCRS) supplied by Thermax Ltd. The General Instructions which are not detailed

out in this document, are to be performed in accordance with standard and safe acceptable practices as may be required by local codes, specifications and or regulations. The instruction contained within this manual must be read before undertaking any work on the equipment supplied. For any queries, please contact Thermax Limited.

3 Product Identification

The product and its specifications' details are identified as per the figure 3.1A. The same will be shown on the name plate on the product.



or all maintenance, service & spares requests, it is important to mention the serial identification number as mentioned in the name plate details of your product to Thermax Ltd.

Thermax Condensate Recovery System comprises of Flash Vessel, steam operated condensate transfer pump without any mechanical moving parts and atmospheric de aerator head for effective mixing of condensate along with flash steam and makeup water in feed water tank.

figure 3.1A

TACTS

MODEL :
DESIGN PRESSURE - RECEIVER : Kg/cm²
DESIGN PRESSURE - PUMP VESSEL : Kg/cm²
SR NO :
MFG YEAR :

4 TADIT: Thermax Atmospheric De aerator with Immersion Tube (TADIT)

Thermax Atmospheric De aerator with Immersion Tube (TADIT) is designed to remove dissolved gases and oxygen from Boiler feed water by proper mixing of condensate, flash steam and treated make up water. TADIT is manufactured from stainless steel material to avoid corrosion due to pH, oxygen content in condensate and soft water.

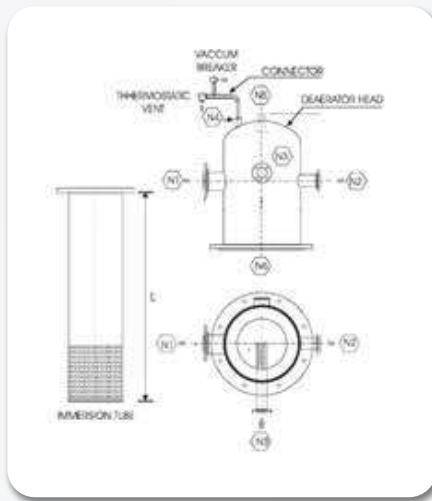


The above mentioned mechanical de aeration is based upon the principle of the solubility of the gases in the water. It decreases as the temperature of the water increases. However, in order to remove the last traces of oxygen in the feed water, chemical treatment should be followed as mentioned in the Boiler manual.

Atmospheric De aerator Head: This is bolted to the feed water tank on the nozzle supplied loose. This nozzle is to be welded on top of the feed water tanks as shown in the GA drawing as shown in figure 4.1A of TADIT

An immersion tube which distributes mixed fluid in tank.

Figure 4.1A



N1	Flash Steam Inlet
N2	Condensate Inlet
N3	Makeup water Inlet
N4	Connector for vent
N5	Reticulation (Plugged)



Immersion Tube must be immersed in FW tank and should have minimum 300mm clearance from the tank bottom.

Ensure that adequate clearance is available above the tank in order to install the immersion tube.

Vertical Space above the feed water tank should be (L + 500) mm, where L = length of immersion tube in mm as shown in figure 4.1A for ease of removal of tube for maintenance, provided if roof shed built above the feed water tank.

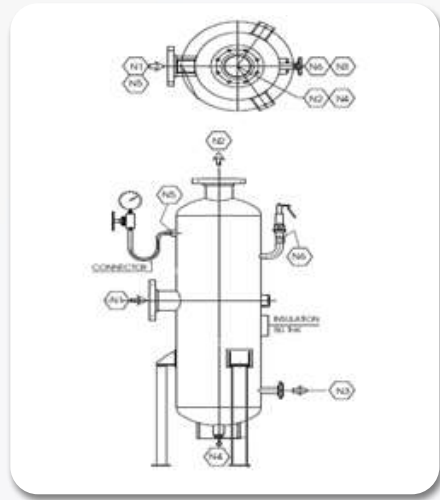
N5 nozzle is for recirculation of water inside the feed water tank for proper mixture of cold and hot water. Generally, this phenomenon will automatically happen through density differentiation of cold & hot water, hence this nozzle will be plugged. In case of higher tank size, this can be used by providing a circulation pump which will not be Thermax's scope of supply.

5 TAFS: Thermax Automatic Flashing system (TAFS)

Thermax Automatic Flashing system (TAFS) is a pressure vessel installed in vertical position with flash steam outlet nozzle at the top. TAFS is provided with nozzle for high-pressure condensate inlet, flash steam outlet, hot water outlet and a drain. It is also provided with a pressure gauge and safety valve. The flash vessel is designed in such a way to ensure effective separation of flash steam from condensate.

A 'Y' strainer and float trap is supplied loose and is to be piped as shown in the P&I Diagram figure 5.1 A with isolation and bypass valve.

Figure 5.1A



N1	Condensate Inlet
N2	Flash outlet
N3	Condensate outlet
N4	Drain
N5	Pressure Gauge
N6	Safety Valve



Condensate should flow to TAFS preferably under gravity.

Whenever more than one trap is connected to a common condensate header, each connection should be preceded by a disc check valve (DCV) of same size as that of condensate line size at the outlet of trap.

Ensure clear distance of 500 mm between centre line of condensate outlet and top of TACTS receiver inlet nozzle.

Flash steam piping is to be elevated minimum 500 mm above the de-aerator and brought down vertically to connect it to de-aerator head nozzle N1(Figure 4.1A). Please follow this as per details provided in standard P&I.

The pressure inside the flash vessel will depend upon the back pressure created by the piping connected between flash vessel nozzle (N2) as shown in figure 5.1A & De aerator Head nozzle (N1) as shown in figure 4.1A. Any pressure if exceeds the designed pressure, will be relieved safely through the provided safety valve.

Take safety valve exhaust line to safe location to avoid steam venting to nearby equipment.

6 TACTS: Thermax Atmospheric Condensate Transfer System

TACTS is a plug-in system specifically designed to collect and pump hot condensate to use as boiler feed water. The whole system is capable of handling condensate flow capacities ranging up to 16000 kg/hr. Please refer the chart number 6.1A for capacity range with reference to the model, motive pressure and back pressure.

Chat number: 6.1A

Operating Motive Pressure kg/cm ²	Size of tank mm	2000	3000	4000	5000	6000
2	0.5	1180	1790	2380	2980	3580
3	0.5	1080	1680	2280	2880	3480
4	0.5	980	1580	2180	2780	3380
5	0.5	880	1480	2080	2680	3280
6	0.5	780	1380	1980	2580	3180
7	0.5	680	1280	1880	2480	3080
8	0.5	580	1180	1780	2380	2980
9	0.5	480	1080	1680	2280	2880
10	0.5	380	980	1580	2180	2780
11	0.5	280	880	1480	2080	2680
12	0.5	180	780	1380	1980	2580
13	0.5	80	680	1280	1880	2480
14	0.5	0	580	1180	1780	2380
15	0.5	0	480	1080	1680	2280
16	0.5	0	380	980	1580	2180
17	0.5	0	280	880	1480	2080
18	0.5	0	180	780	1380	1980
19	0.5	0	80	680	1280	1880
20	0.5	0	0	580	1180	1780
21	0.5	0	0	480	1080	1680
22	0.5	0	0	380	980	1580
23	0.5	0	0	280	880	1480
24	0.5	0	0	180	780	1380
25	0.5	0	0	80	680	1280
26	0.5	0	0	0	580	1180
27	0.5	0	0	0	480	1080
28	0.5	0	0	0	380	980
29	0.5	0	0	0	280	880
30	0.5	0	0	0	180	780
31	0.5	0	0	0	80	680
32	0.5	0	0	0	0	580
33	0.5	0	0	0	0	480
34	0.5	0	0	0	0	380
35	0.5	0	0	0	0	280
36	0.5	0	0	0	0	180
37	0.5	0	0	0	0	80
38	0.5	0	0	0	0	0
39	0.5	0	0	0	0	0
40	0.5	0	0	0	0	0
41	0.5	0	0	0	0	0
42	0.5	0	0	0	0	0
43	0.5	0	0	0	0	0
44	0.5	0	0	0	0	0
45	0.5	0	0	0	0	0
46	0.5	0	0	0	0	0
47	0.5	0	0	0	0	0
48	0.5	0	0	0	0	0
49	0.5	0	0	0	0	0
50	0.5	0	0	0	0	0
51	0.5	0	0	0	0	0
52	0.5	0	0	0	0	0
53	0.5	0	0	0	0	0
54	0.5	0	0	0	0	0
55	0.5	0	0	0	0	0
56	0.5	0	0	0	0	0
57	0.5	0	0	0	0	0
58	0.5	0	0	0	0	0
59	0.5	0	0	0	0	0
60	0.5	0	0	0	0	0
61	0.5	0	0	0	0	0
62	0.5	0	0	0	0	0
63	0.5	0	0	0	0	0
64	0.5	0	0	0	0	0
65	0.5	0	0	0	0	0
66	0.5	0	0	0	0	0
67	0.5	0	0	0	0	0
68	0.5	0	0	0	0	0
69	0.5	0	0	0	0	0
70	0.5	0	0	0	0	0
71	0.5	0	0	0	0	0
72	0.5	0	0	0	0	0
73	0.5	0	0	0	0	0
74	0.5	0	0	0	0	0
75	0.5	0	0	0	0	0
76	0.5	0	0	0	0	0
77	0.5	0	0	0	0	0
78	0.5	0	0	0	0	0
79	0.5	0	0	0	0	0
80	0.5	0	0	0	0	0
81	0.5	0	0	0	0	0
82	0.5	0	0	0	0	0
83	0.5	0	0	0	0	0
84	0.5	0	0	0	0	0
85	0.5	0	0	0	0	0
86	0.5	0	0	0	0	0
87	0.5	0	0	0	0	0
88	0.5	0	0	0	0	0
89	0.5	0	0	0	0	0
90	0.5	0	0	0	0	0
91	0.5	0	0	0	0	0
92	0.5	0	0	0	0	0
93	0.5	0	0	0	0	0
94	0.5	0	0	0	0	0
95	0.5	0	0	0	0	0
96	0.5	0	0	0	0	0
97	0.5	0	0	0	0	0
98	0.5	0	0	0	0	0
99	0.5	0	0	0	0	0
100	0.5	0	0	0	0	0

The pump can be operated by steam or compressed air and can be tailored to meet a wide variety of condensate handling applications. Larger condensate handling capacities available in simplex, duplex & triplex pumps.

The pump works on the principle of positive displacement using motive steam or compressed air pressure. Condensate flows by gravity from receiver to the pump chamber through interconnecting piping and inlet non-return valve.

The specially designed Conductivity based level sensor in the pump chamber senses the condensate and signalling the 3/2-way (Refer note (i)) valve to pump the condensate through the smart control panel O-Con+. Total condensate flow can be measured by using the totalizer reading provided on the smart control panel O-Con+.

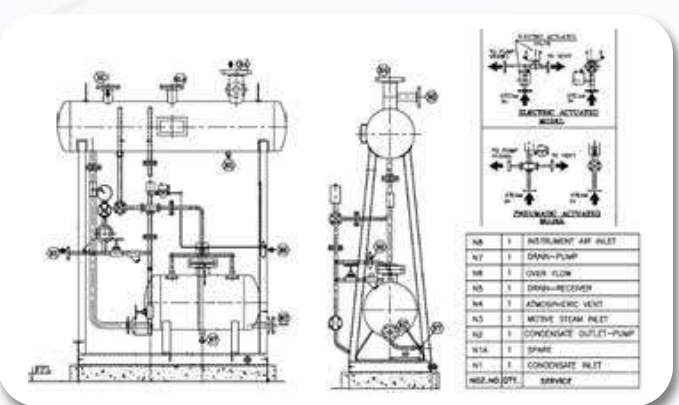
The motive pressure should not exceed, or should not be less than as specified in the chart number 6.1A, to get the desired condensate flow range.



Any excess or less motive pressure will lead to condensate overflow through the nozzle N4 & N6 as shown in figure 6.1B. Also operating in this condition will lead to malfunction of the system and lead to damage of the accessories & instruments and void in warranty terms.

Note (i): This product also comes along with the option of 2-way electric valves.

Figure 6.1B



7 Unloading Receiving and Inspection

The TCRS components are supplied in semi assembled condition, duly packed in polythene sheets & wooden cases/boxes for assembly & installation at site.



Ensure that the wooden cases should not be dropped or turned to any other position other than marked on the cases.

At the time of receipt at site, a thorough visual inspection of the product should be made for evidence of damage during shipment. Packaging slip should be referred for checking the items supplied for the system.

On receipt of the consignment at site, check that all the cases have been received as per delivery documents & packing slip.

By careful inspection, determine whether any damage/loss has occurred in transit, in spite of proper checking and loading of each component/equipment, at our factory before dispatch.

In the event if any damage is noted, the Company should be notified at once so they can start claims procedure for repairs or replacements, as per applicable clauses of contract.

! Your product is carefully manufactured, assembled and inspected at each level before dispatch. Sometimes during transit, there is the possibility of piping connections getting loose. The same is to be tightened at the site during installation, if found loose.

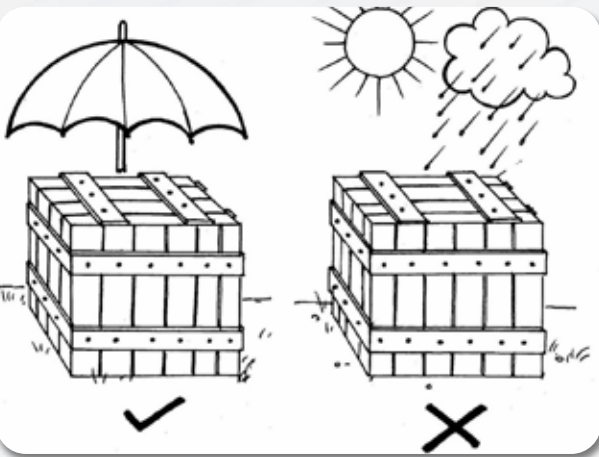
8 Storage

The place of storage of these equipment should be:

- Dust-free, clean, dry and well ventilated
- Silica gel packed in cloth back shall be placed inside the electrical panels for absorbing moisture.
- The silica gel shall be inspected periodically for colour change. Re-charging of silica gel shall be carried out as and when required.

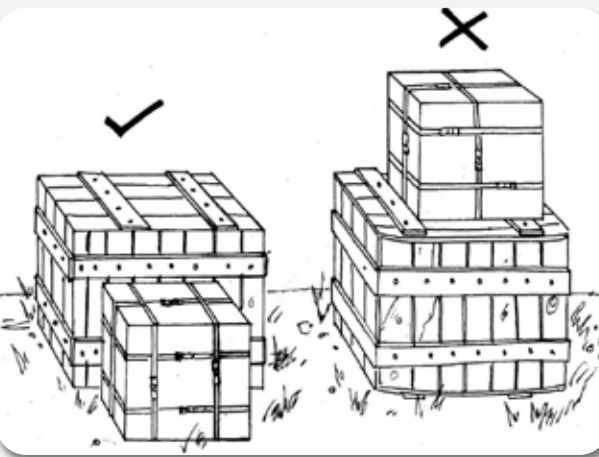
A) All the material should be stored under the roof and should be protected from rain, water or direct sunlight.

Figure No 8.1A: Material should be stored under roof.



B) Do not pile up cases.

Figure No 8.1B: Do not pile up cases.



C) Do not store heavy material on soft soil.

E) Parts should not be stored under corrosive atmosphere.

F) Periodically the unit should be inspected to make sure no damage, such as corrosion, is taking place.

9 Installation Guidelines

- Ensure proper grouting and anchoring of TACTS base.
- Route the pump drain (N7) & overflow (N6) -to-the safe location drain pit / drainage system
- Connect motive steam/air to the nozzle (N3) as shown in the above FIG 6.1B
- Connect instrument air to air filter regulator (AFR) with isolation needle valve (customer scope) for operating the 3/2 way valve (Refer note (i)).
- Kindly follow the Line sizes for each model of the TACTS, is as referred in chart number 9.1.

Chart 9.1

TA CTS Mo del	Con den sate Inlet (N1 & N1A)	Cond ensate Outlet (N2)	Mot ive Ste am/ Air (N3)	Ve nt (N4)	Pu mp Dra in (N7)	Ov er Fl ow (N6)	Pit Size L x W x D (H) mtrs
Rx 100i	40 Nb	40 Nb	15 Nb	40 Nb	15 Nb	40 Nb	1.9 x 1.8 x 1.0
200i	50 Nb	40 Nb	15 Nb	50 Nb	25 Nb	40 Nb	2.5 x 1.8 x 2.0
300i	50 Nb	50 Nb	15 Nb	50 Nb		40 Nb	
400i	50 Nb	65 Nb	15 Nb	80 Nb		40 Nb	
500i	50 Nb	80 Nb	15 Nb	80 Nb		40 Nb	
600i	80 Nb	125 Nb	25 Nb	100 Nb		50 Nb	3.0 x 2.0 x 2.0

9 Control Panel & Instruments

10.1 O Con+, smart control panel will be delivered along with TCRS. The controller is pre-programmed at factory, and has fixed parameters. These settings are normally sufficient for general usage of TCRS. 230V, 1 Phase, with proper earthing (voltage to neutral & earth to be less than 3V) UPS power supply to be provided by customer at site.

10.2 3 core 1.5 sq mm cable of 5 mtrs length will be supplied by Thermax Ltd. The same to be installed at site and necessary termination as shown in the table 2. Customer to provide 2 core 1.5 sq mm cable for solenoid coil. These cables need to be laid with proper gland packing and cable tray.

It is always recommended to check the continuity of the cables before termination.

10.3: Refer the below table 2 for terminal connections

Table 2

Terminal No	Connection	Terminal No	Connection
1	240 V AC 50 Hz	7	Ref (E3)
2		8	Steam SOV
3	Neutral	9	
4	Earth	10	PE
5	High	11	Vent SOV
6	Low (LO/E2)	12	

10.4 O Con+ settings

10.4.1 During pre-commissioning, the O-Con+ panel needs to be set for standard flow of condensate per stroke as per your product model, following are the procedures to follow.

- To RESET Counter Press F1 Key. Enter Password- **** & Press F3 to reset.



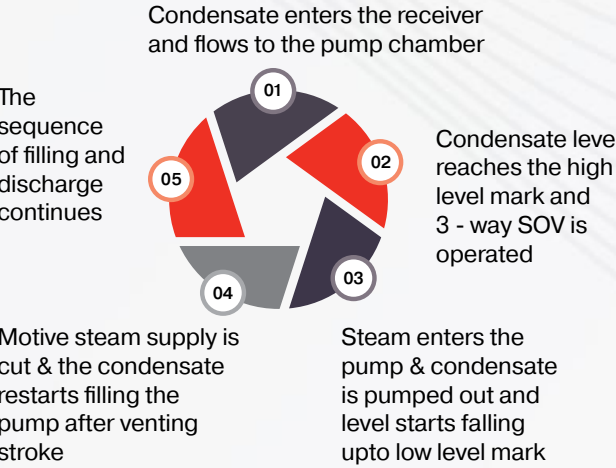
- Press "SET" key for 05 Sec to change the multiplication factor/stroke capacity. Press "ENTER" after changing the value



The control panel is given as IP 65, however, in order to ensure IP protection, kindly ensure proper glanding for the cables.

Stroke Capacity for TACTS Rx i- 35 Ltrs/Stroke, 200i to 500i - 50 Litre/Stroke & 135 litre/Stroke for TACTS 600i.

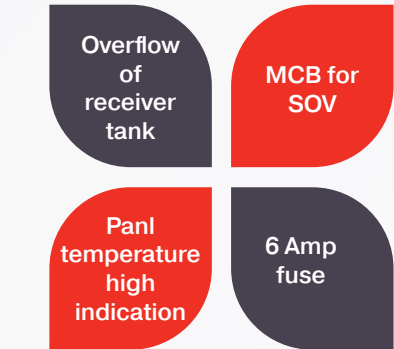
11 System Operation



- System needs to be flushed thoroughly before starting of the unit.

12 System Safeties

- Over pressurisation of receiver tank
- Sugar load in the process
- Short circuit at o/p of MCB



- If ambient temperature > 50 Deg.C.
- Fluctuations in main supply

13 Troubleshooting

Symptoms	Cause/Check Points	Remedy
Receiver Overflows	Strainer between Receiver and pump body clean strainer Screen choked	Clean Strainer Screen
	Inlet/Outlet DCV stuck closed or Fails	Clean, Lap if required & Refit or change DCV
	Level/Sensor controller malfunction	Check Wiring & Perform bucket test/loop test. If required change the sensor/ controller
Lengthy Discharge	Outlet DCV fails in closed condition (Leaking)	clean, lap if required & Refit or change DCV
	3 way valve fails with steam port open	Replace the 3 way valve
Live steam coming from vent port of 3 way Valve	3 way valve leaking	Replace 3 way valve
3-way SOV Not operating	Insufficient air pressure to valve	Check air pressure
	Insufficient air pressure to valve	Adjust air pressure
	SOV short/burnt	Replace SOV
	Controller not working	Replace the Controller
	SOV MCB Trip	Reset MCB
	Main Fuse Blown	Replace Fuse



- Up to 5000 hours of operation, strainer needs to be checked for every 200 hours of operation.
- After 5000 hours of operation, the strainers need to be checked for every 5000 hours.

- If any additional or new welding work is carried out at the upstream of the pipeline, and if TCRS is shifted to other location, then, again for up to 5000 hours of operation, strainer needs to be checked for every 200 hours of operation.

- Up to 3000 hours of operation, the level sensor needs to be checked for every 200 hours of operation. If any scale or rust is deposited on the rods of level sensor, it needs to be cleaned to ensure smoot operation of the system to avoid overflow.

- After 3000 hours of operation, the level sensor needs to be checked for every 3000 hours.

15 Warranty

Only trained or instructed personnel may be assigned to operation or servicing.

All our equipment is thoroughly inspected before dispatch and therefore can be depended upon for long and trouble-free services. We undertake to make goods by replacement or repair, defects arising out of faulty design, materials or workmanship within 12 (twelve) months of the date of commissioning or 18 (eighteen) months from the date of dispatch, whichever is earlier subjected to mentioned in your purchase order warranty terms. The parts, in respect of which a claim is made, must be sent to our works at buyer's expenses. If the claim is found to be legitimate, we shall refund such expenses.

Warranty Excludes

- Normal Wear & Tear
- Damages/defects due to wrong operation at the purchaser's end, and/or arising out of forced major.
- Bought out components are guaranteed by us only to the extent of guarantees given to us by our suppliers.
- Electrical components such as heaters, motors, contactors etc. Rubber components and instruments such as pressure gauges, thermometers, controllers, etc. are however, not covered under this warranty.

This warranty is valid, subject to the following conditions:

- Installation completed within three months from the date of dispatch of the equipment, and as per our installation instructions.
- The supply/ installation formally accepted as per the handing over clause.
- Use of specified utilities in technical quotation.

- The equipment being operated and maintained as per our Operation and Maintenance Manual.
- The equipment or part thereof not being subject to accident, alteration, abuse or misuse.

- Any replacements/repairs required under provisions of the above warranty will be carried out at either on site or at works. In the latter case, buyer will send the defective parts to our works at buyer's cost & liability.

- Warranty period for the entire equipment including replaced or repaired parts will be limited to the unexpired portion of the total warranty period.

- Accessories and fittings not manufactured by us, form an integral part of the equipment supplied. The warranty for such accessories & fitting will be in line with main equipment.

- If the purchaser delays to lift the equipment beyond its readiness, the warranty will be limited to 18 months from the date of readiness at our works.

- Any repair / replacement on our equipment during the warranty period shall be carried out by authorized representatives in writing from us.

- The warranty obligations will be honoured by us provided Buyer has fulfilled obligations under the order relating to release of due payments, etc.

- After repairs/replacement, warranty period for the entire equipment including replaced or repaired parts will be limited to the unexpired portion of the total warranty period.

- Any short supply or damages to the equipment to be intimated to Thermax within 15 days of receipt of material at site. Any late report will void the warranty.

- If the transit insurance is in client scope, damages and missing items during transit to be claimed by clients directly.

- Any improper use, intervention in the design and deviation from the design data will automatically lead to termination of the warranty.

16 Recommended Spares

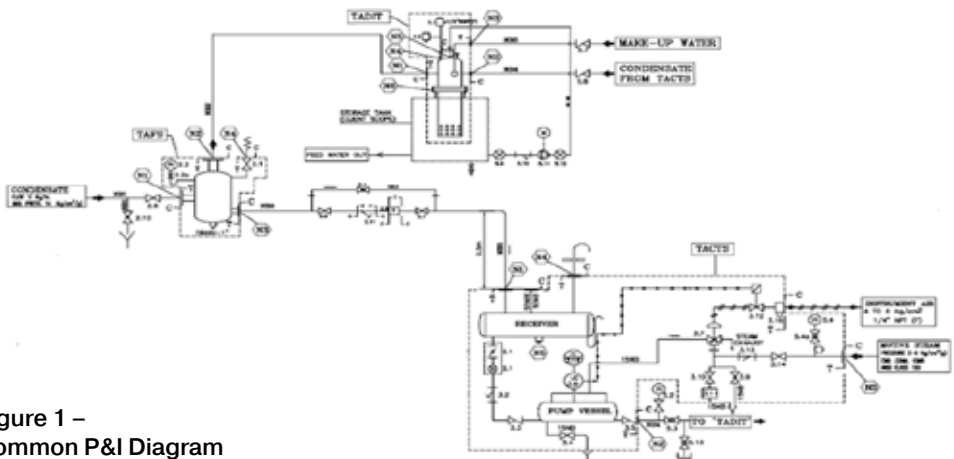


Figure 1 – Common P&I Diagram



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Steam Service Manuals