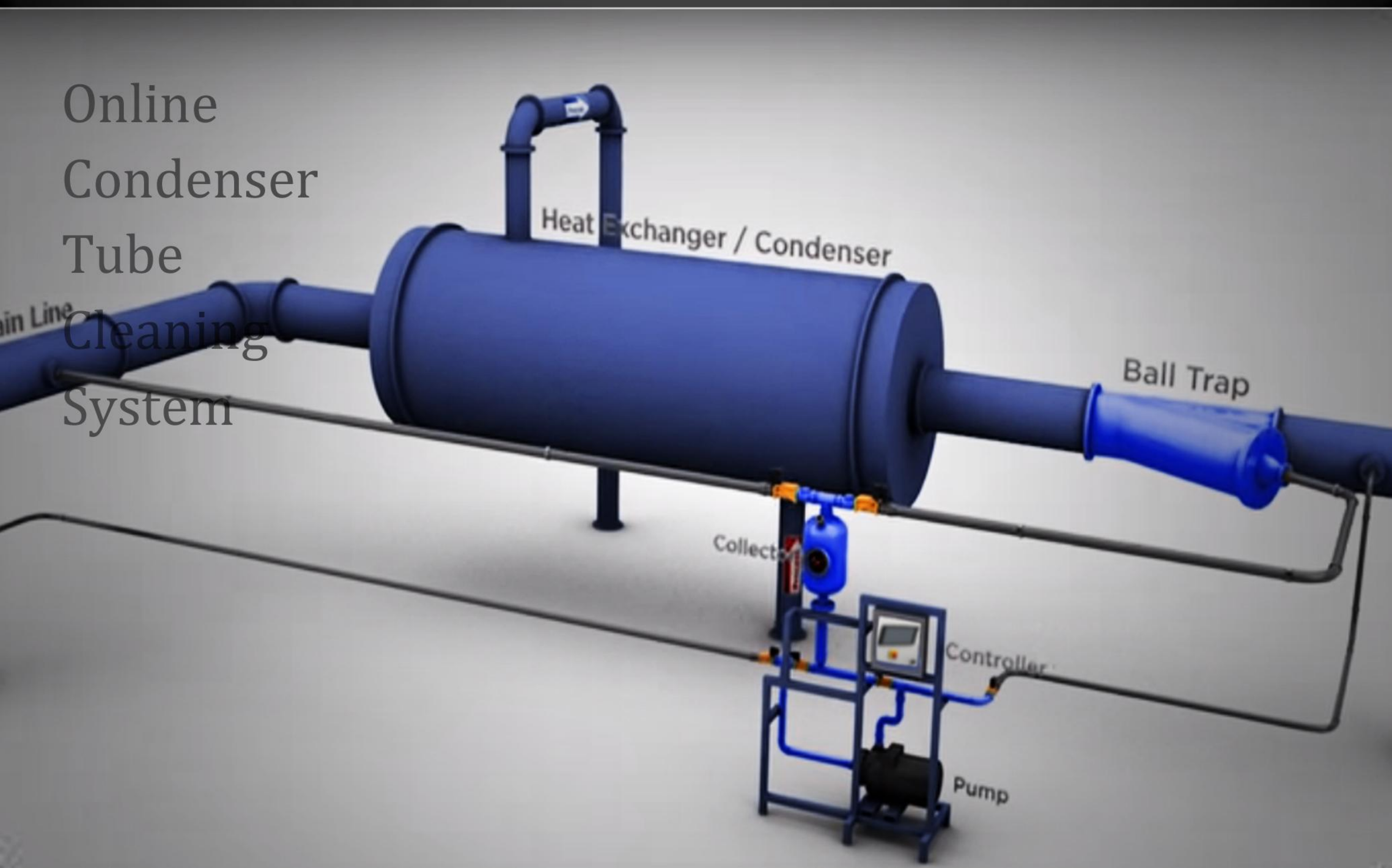
VULCAN INDUSTRIES

Online
Condenser
Tube
Cleaning
System



Introduction

The rising trend as witnessed and predicted the world over shows us that there has been a Global increase in energy consumption. This rising demand causes the Industry & the Commercial Market to indulge in excessive expenditure to fulfil their basic necessities.

We, Vulcan Industries, through our Online Condenser Tube Cleaning System, endeavor to help in reducing these expenditures. These overheads are not attributed only to energy loss, but also towards improving technical infrastructure and preventing further damage to the environment!

Major factors contributing towards Expenditures & Environmental Damage:

1. Loss of Energy
2. Loss of Water
3. Technical problems
4. Use of chemicals & softeners

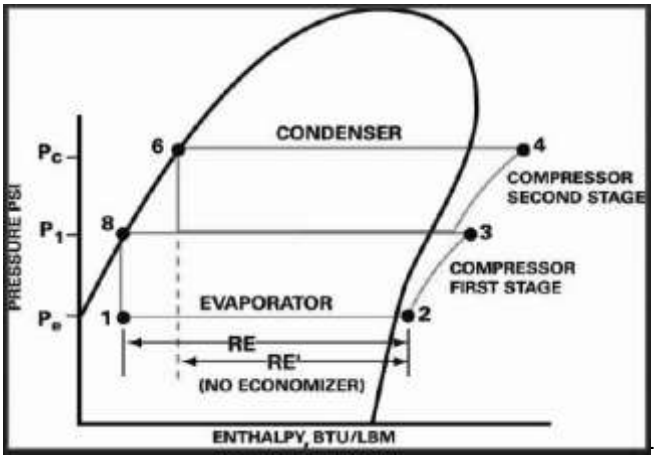
Loss of energy

We can find loss of energy in two places of the heat transfer process:

1. **In the Heat Exchanger/Condenser/Chiller:**
   During the process of heat transfer the constant evaporation leads to the formation of scaling on the inner walls of the heat exchanger tubes. This phenomenon is exacerbated by the sediments present in the water. This leads to significant loss in heat exchanging capacity. Depending on the industry, the heat exchanger can have water, chemicals, or any other liquid running through the tubes. This problem of accumulated sedimentation in each case drastically reduces any heat transfer.

2. **In the cooling tower/ cooling circle:**
   Here we can find the same problems as in the heat exchanger, together with other elements such as bacteria & algae. In the cooling tower the efficiency of the energy release to the atmosphere damaged, because process difficulty due to the scale & sediment. The efficiency of the water spreading on the "Lamellas" and the air flow is reduced. In a closed cooling circle we can find again the difficulty of heat transfer due to dirt problems and others, affecting the fen-coils, side.

In this diagram we can see the effect of reduced heat transfer efficiency from the compressor side. The compressor needs to work harder to produce more energy for the heat transfer process. (Compressor Second Stage)



Online Condenser Tube Cleaning System Applications

Power Stations

Online Condenser Tube Cleaning Systems have been widely used in this application for many years. Biggest advantages of our system are the technology, the competitive costs and the fact that the balls inject & return to the collector without additional loss in heat exchanger pressure.

Refineries & Chemical Industries

Here a large number of heat exchanger processes require a regular cleaning. This is done at present by means of manual pressurized and chemical cleaning. This unfortunately requires shutting down of the heat exchanger and unnecessary costs in maintaining the system.

Pharmaceutical Industry

In this industry the production process requires a constant temperature. Due to the sedimentation and scaling in the Heat Exchangers, there is reduction in output due to changes in temperature. The temperature differential over the walls becomes higher & the media can be locally overheated. This results in a drop in product quality.

Textile Industry

These plants are highly affected due to the dirt in water towers caused by the production process. This blocks the heat exchangers.

Plastic Industry

Their problem lies in small heat exchangers and smaller diameter inner piping which prevent mechanical cleaning. This often involves rinsing with acid, whereby heat exchangers are often damaged.

Air Conditioning

Applications of central air-conditioning units lie mostly with commercial buildings, like hospitals, banks, hotels, office buildings, shopping centers etc. A specific advantage of this market is that all air-conditioners and coolers work identically. Therefore power-saving calculations appear throughout each and every manufacturer's literature and one can calculate the pay-back time very accurately. Energy savings of 15% - 30% are very common in this industry.

Cooling Systems

These systems are used in plants for the production of dairy products, ice cream, meat processing plants, and cold storage plants. These systems work around the clock, therefore they are susceptible to problems involving downtime for purposes of prolonged treatment & cleaning of heat exchangers, leading to losses via interruption in the production process.

Ships

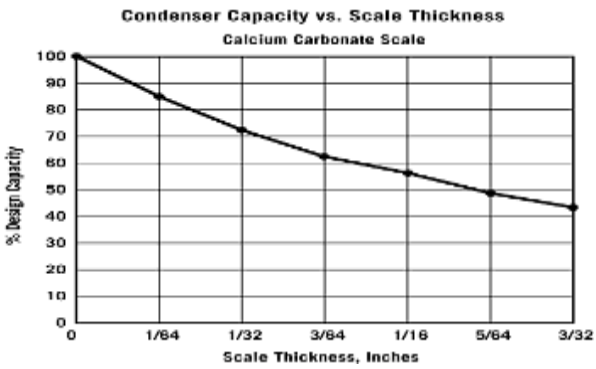
Given the presence of algae & microorganisms in the sea water, which is often used for cooling, these are liable to cause problems so that the heat exchangers lose their excellence of operation. New ships carry only small crews, thus there is no available personnel to deal with the high frequency treatment required by heat exchangers. Furthermore a ship's downtime costs may amount to thousands of dollars per day.

Savings Calculation

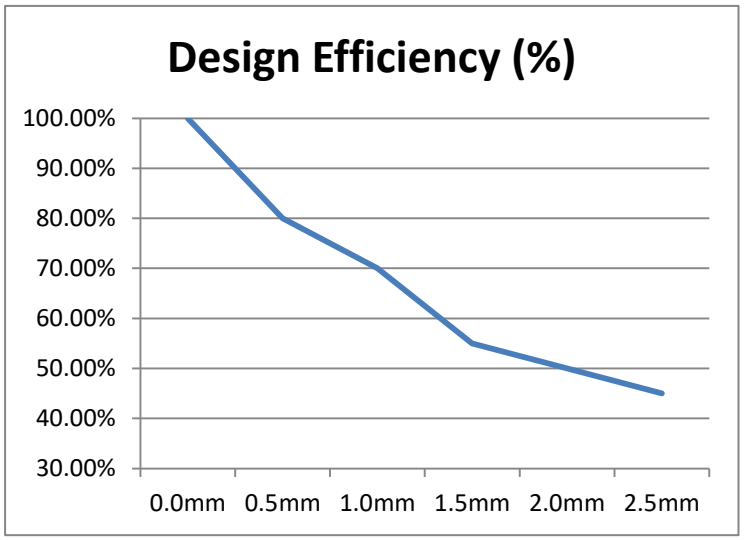
Our Online Condenser Tube Cleaning System saves our clients a lot of money from the daily/monthly/yearly expenses by reducing energy cost, technical cost and other cost which most of us don't notice during the routine everyday processing.

The following charts were made by some of the most known international companies which produce heat exchangers, condensers, and cooling towers. We can see the effect of scaling/sediment on the efficiency of heat transfer and the work of the compressor efficiency.

Scale thickness	Fouling Factor(FF)
0.000"	Clean Tube
0.006"	0.0005
0.012"	0.001
0.024"	0.002
0.036"	0.003



OCTCS saves 2 types of losses:
1) Energy Saving
2) Water Saving



Energy Saving:
Condenser Capacity (TR/h) x Compressor efficiency (%) x working hours in a season (h) x cost of energy (INR/Kw/h) x Estimate Saving (%)

Water Saving:
Drainage water (m3/h) x working hours in a season (h) x Estimated Savings (%)

Even if Chemicals are used, 1-1.5 mm of scaling is formed. This data is provided after a thorough research of various condensers and equipment worldwide.

Energy Savings for Closed Cooling Systems

One important point that most people don't know regarding closed cooling systems, that those systems are not closed, as we think. All kinds of dirt, algae, and corrosive materials go through the cooling circulation and cause energy loss and technical problems. In the chart below we can see the effect of these factors on the energy transfer efficiency.

If we look on the other side of the cooling systems, we find the fan-coils. The Fan-coils are the last step between the cold water of the cold water of the condenser system and the cold air that we feel inside the room. The Fan-coils' structure and method of operation is similar to the structure and method of operation of a car radiator. The sedimentation in closed cooling systems blocks the optimal energy transfer and blocks the fan-coils. These factors, lead to the fan-coils demanding a lot of maintenance, replacement, and use of energy for the cooling.

Fouling Thermal Resistance (HR)(Sqft)(^{o}F)/BTU	Overall Heat Transfer Coefficient** BTU/(HR)(Sqft)(^{o}F)		Thickness of Scale* (Inch)	Increase of required Heat Transfer Area *** (Approximate %)	
	Chiller	Condenser		Chiller	Condenser
0.0000	400	850	0.000	0	0
0.0005	333	595	0.006	20	45
0.0010	286	460	0.012	40	85
0.0020	222	315	0.024	80	170
0.0030	182	240	0.036	120	250

Table: Heat Transfer Surface required to offset fouling

*Assume a mean value for the Thermal Conductivity of the scale of 1.0 BTU/(HR)(Sqft)(^{o}F per FT).
**The Over-all heat transfer coefficient selected for this illustration are typical for a flooded cooler and a water cooled refrigerant condenser. However, because it is possible to have different over-all heat transfer coefficient depending on the system, the effect on the Over-all heat transfer by the scale will vary.
***SQFT of inside surface of tube in heat exchanger.

Our Online Condenser Tube Cleaning System protects you from unnecessary expenditures, loss in efficiency, loss in production, and removes the need to choose between cost and environmental damage!!!

Power Stations

Oil Refineries

Chillers

Hospitals

Shopping Centers

Pharmaceutical Plants

Ships

Submarines

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#117 Atlanta Estate, Off Goregaon – Mulund Link Road, Goregaon (E), Mumbai – 400 063.
+91 22 6555 2151 | contactus@vulcanindustriesindia.com | www.vulcanindustriesindia.com