Online tube cleaning system chiller water system

(***For Medak Bulk-drug Cluster***)

Introduction:

The pharmaceutical industry is one of the fastest growing segments of the Indian economy and has experienced rapid and sustained expansion since the second half of the 20th Century. Indian pharmaceutical manufacturing companies are present at each stage of the production process: APIs; pharmaceutical formulation intermediates (PFIs); and finished dose products (FDPs, the end product). PFIs are the intermediate product between an API and a finished dose. An API is the base ingredient of medicine that is biologically active, and the term bulk active (or bulk drugs/ingredients) is also used. Most of the Indian companies specialise in one or two of these three stages.

Today, India is one of the world's leading suppliers of generic drugs, which account for approximately 75 per cent of its market by volume16 and revenues of $15 billion. The country is responsible for around one-fifth of the world's production of generics, which is considerably higher than its share the overall pharmaceuticals market (which stands at approximately 2%). India's Bulk Drugs Manufacturers Association describes the sector's recent growth as "phenomenal" and "one of the highest among the developing countries."Anti infectives, which include antibiotics, antivirals and antifungals, are the largest segment on the domestic market, accounting for around one quarter of total turnover.

The Indian pharmaceutical industry is highly fragmented, with more than 20,000 registered manufacturing units nationwide. It is also geographically dispersed: production takes place in multiple locations across the country, with the states of Maharashtra, Gujarat, Telangana, Andhra Pradesh, West Bengal and Tamil Nadu all registering a sizeable manufacturing and processing presence.

The city of Hyderabad in Telangana state, which was part of Andhra Pradesh until its division into two separate states in 2014, emerged early on as a pole of bulk drug manufacturing. In 1961, Indian Drugs and Pharmaceuticals Limited (IDPL), a government-owned company, was set up under the premiership of Jawaharlal Nehru with a mandate to "free India from dependence on imports and to provide medicines to the millions at affordable prices." Its establishment in Hyderabad (it also has offices in New Delhi and Rishikesh, Uttarakhand state) heralded the emergence and subsequent concentration of the generic drug industry in the city.

According to the Indian Bulk Drug Manufacturer's Association (BDMA), Hyderabad there are 47 SME registered units in Medak District. The source of energy for this units is coal and electricity. Coal is supplied from Singareni Collieries Company Limited (SCCL) and electricity is drawn from Telangana State Southern Power Distribution Company Limited (TSSPDCL).

Existing Practice:

Chillers are the significant energy consuming utilities in any bulk drug pharmaceutical unit. They consume around 40% of the total energy consumption of the unit. They are variety of chillers available

in bulk drug units with different cooling requirements ranging from +5 ^{0}C to -40^{0}C. The chiller capacities also range from 100TR to as high as even 600TR.The chilling requirements change from product to product as per their process requirements.

As per the process requiement the chilled water meets the cooling requirement in the reactor as per stipulated time and the return water comes back to the chiller to desiminate the heat at cooling tower.During this process their will be formation of scaling in condensor tubes due to carbonates and bicarbonates of calcium and Magnesium salts present in water. The pharma experts says it takes some time to develop the intial scaling may be weeks but the increment in thickness will be drastically in few days.This will sevearly effect the kW/TR consumption of the chiller, as the approch between condensor outlet and evaporator inlet temperature will be increased, due to poor heat transfer across condensor and this will not noticed by any SME unit till the effect is severe.

The existing practice for cleaning of chiller condenser is done manually and it requires 2-3 employees per day to clean the tube. And this activity is done 2-3 times in a month to clean the tubes, as this unit will have high level contamination on water side.

Proposed technology:

It is proposed to install the online Chiller Condenser Automatic Tube Cleaning System in replace of manual cleaning for condenser in most of the pharma industries in Medak District. The proposed systems will run automatically.

The Working Principle is descried below:

Injection Cycle:

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The injection cycle is shown in the figure-A below:

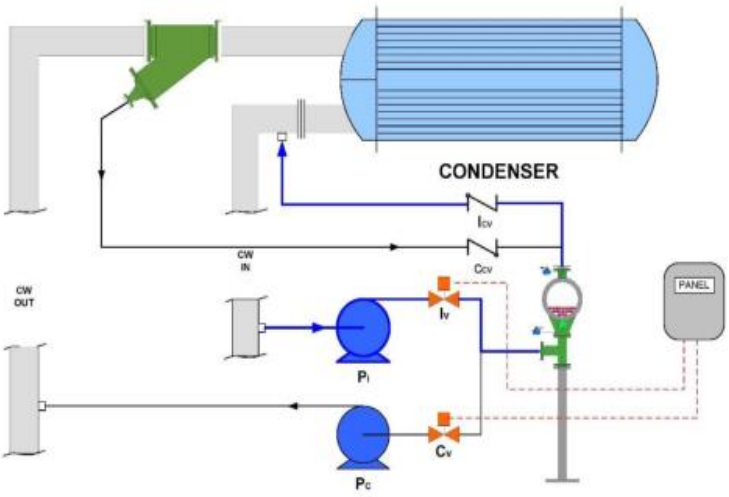
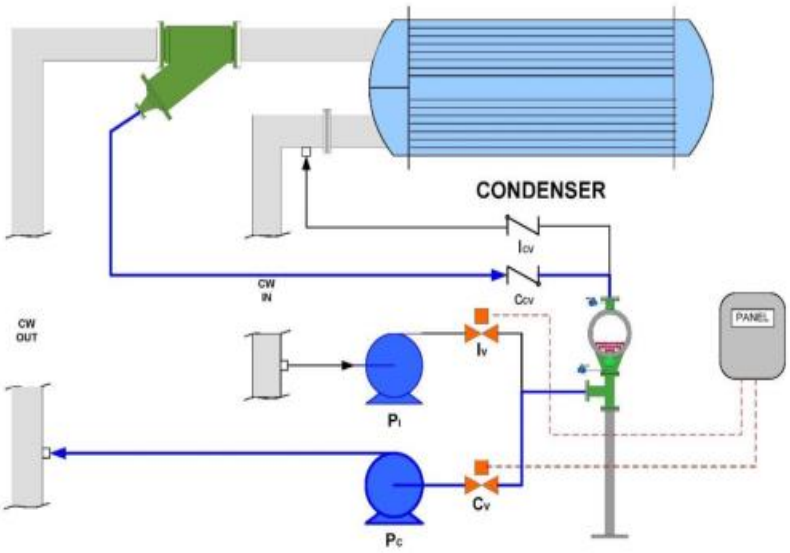


Figure-A: Injection Cycle

injection control valve opens and injection pump starts. Injection pump takes water from the Cooling Water inlet pipe and boosts the pressure in the Ball Collector (BC), where the cleaning sponge balls are resting (As per the path shown in the blue line). As soon as the pressure in the ball collector boosts, the sponge balls are injected almost simultaneously at the heat

exchanger tube sheet with the help of injection pump thereby giving effective spread to the sponge balls in various tubes, the sponge balls would pass through the tubes and clean the fouling /scales/deposits inside the tubes. Once the sponge balls come out of the heat exchanger tubes they are collected at ball trap & wait for the collection cycle.



Collection Cycle:

In the collection cycle, collection control valve opens, and collection pump starts. Collection pump takes water along with the sponge balls from the Ball Trap (BT), the sponge balls are arrested by the Ball Collector on the way back & water is sent into the Cooling Water outlet pipe (As per the path shown in the blue line). They are sent back to the ball collector with the help of collection pump. The entire process is a batch operation, automatically controlled by PLC and occurs 2-3 times in an hour. These pumps run hardly for 1-2 minutes for injection and collection of sponge balls in each cycle.

Energy & monitoring saving:

S. No	Parameter	Value	Unit
1	Approach before descaling	6	Degree Centigrade
2	Approach after descaling	3	Degree Centigrade
3	Increase in Condenser Approach	3	Degree Centigrade
4	Energy Saving Potential **(results from Installed locations minimum)**	10.5	%
5	Chiller Capacity installed capacity	500	TR
6	Chiller Operating Capacity	500	TR
7	Specific Consumption Clean Condenser	0.7	kW/TR
8	Specific Consumption Fouled Condenser	0.7735	kW/TR
9	Average Load	70	%
10	Power loss by chiller @average load	25.725	kW
11	Savings potential on conservation basis(Considering 80% Savings)	20.58	kW

S. No	Parameter	Value	Unit
12	Saving potential for 2 chillers(considering 80% savings)	41	kW (one setup can be utilised for 2 running chillers within 34 meters distance from the installation)
13	No. of Operating hrs in a day	24	Hrs
14	No. of operating days/year	300	Days
15	Electricity tariff	7	Rs/kWh
16	Annual Saving on Energy Consumption	20.66	Lakhs
17	Investment	15	Lakhs
18	Simple Pay Back Period	8.0	Months

Benefits:

- Results shown up to 25% energy saving in HVAC chillers
- Increases cooling capacity of HVAC Chillers
- Improves condenser tube life
- Improves Compressor Life
- Avoids costly shutdown and downtime
- Eliminates offline cleaning completely
- Avoids harmful chemicals that are used for descaling

Replication Potential:

Based on the discussion with association and also units it is estimated that the technology has a replication potential of 15 to 20 installation in the medak cluster. Based on the given replication potential the overall project is given as follows:

Chiller Condenser On Load Automatic Tube Cleaning System			
S.No	**Parameter**	**Value**	**Units**
1	Total No of SME Units in the cluster	47	No's
2	Replication Potential of the units in cluster	15	No's
3	Envisaged Annual Energy Savings per Unit	2.99	Lakh kWh
4	Investment Required per Unit	15	Lakhs
5	Envisaged Annual Energy Savings per Cluster (15 No's of Units)	44.9	Lakh kWh
6	Investment Required for Cluster (15 Units)	225	Lakhs
7	Cost of the Electricity Unit	7	Rs/kWh
8	Envisaged Annual Monetary Savings for Cluster	314.3	Lakhs
9	Payback Period	8.6	Months
10	Savings in MTOE	386.0	MTOE
11	Reduction in CO2 in Cluster	3681	TCO_2

Availability of the technology

There are many technology providers available in India and many of them have their base in Hyderabad & Pune. The following are the technology providers available in the cluster.

1. ECOMAX SOLUTIONS PVT LTD
2. TAPROGGE INDITECH PRIVATE LIMITED

Effect on the Process:

This technology will reduces SEC per TR by arresting fouling and thereby increasing cooling capacity of HVAC chillers.

Reasons for Unpopularity:

This technology has yet not penetrated in to the SME cluster because of the following reason:

- ✓ Lack of knowledge and not updated with the recent developments.
- ✓ Financial constrain being an MSME.
- ✓ No one has yet demonstrated the results of the technology in MSME unit

Payback Period:

The simple payback period for the technology comes out to be less than a year.

Why the technology has not been implemented so far in the cluster?

SME units were not aware about this new technology.

Is there any operational risks involved?

No operational risks involved and won't effect the regular operation.

Boundary Conditions/Limitations

This technology needs to be implemented near the chiller room. As such there is no limitations.

Vendor Information:

1.0 Giridhar Jakkampudi
Deputy Manager – Sales & Marketing (South)
ECOMAX SOLUTIONS PVT LTD
709 |Supreme HQ| Near Audi Showroom
Pune Bangalore Highway| Baner|Pune-411045

2.0 **Ecoair Cooling Systems Solutions**
Survey No 279, Hissa No 1,
Village Maan, Hingewadi Phase 2,
Tal. Mulshi, Pune,
Maharashtra 411057

3.0 Skanth Manian (Senior Manager)
Vulcan Industries
No. 117, Atlanta Estate, Off Goregaon Mulund Link Road
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Photographs during the field visit: