



GALAXY ENERGY SOLUTIONS LLP

Simply Green

The Saving Analysis Report

PRODUCT



COMPANY



SITE

**SAWAI MAN SINGH HOSPITAL,
JAIPUR**

AGENCY

**PUBLIC WORKS DEPARTMENT
(ELECTRICAL WING)
GOVT.OF RAJASTHAN**

Usharma

Dr. K.C. Sharma
Fellow: FIE, ISTE, SAE
B.E.(Mech.), M.Tech.(IIT Mumbai)
Ph.D., UNQC-QIP (Japan)

DATE OF INSTALLATION

8th April 2018

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EXECUTIVE SUMMARY

The report presents saving analysis after usage of Hydromx (9TH April 2018), a heat transfer fluid in the chiller unit of 22.7 TR of Blue Star, installed at **SMS Hospital Jaipur**, Rajasthan, India for their CTOT area. This facility is a part of quality healthcare that is meant to provide world-class service at this hospital.

Based on observations made through a data logger installed on the system for 12 days when system was running on water (before upgrade) and for 12 days after upgrade to Hydromx, it was seen that in 12 days, **27% Energy Saving per hour** is achieved and the *reduction in energy consumption per TR is 29%*. All this while the efficiency of the system improved remarkably by 41 %.

12 DAYS DATA RESULTS:

27%

REDUCTION IN ENERGY CONSUMPTION PER HOUR ACHIVED.

29%

REDUCTION IN ENERGY CONSUMPTION PER TR ACHIEVED.

41%

IMPROVENMENT IN PERFORMANCE (COP)

INR 85,625/-

AMOUNT SAVED IN A YEAR

Assumptions – Cooling load / day = 10 TR/HR

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Average run time / day = 8 hours

Working days / year = 300 days

Energy charges = Rs. 8 / kWh

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Thus, the application of Hydromx, as heat transfer fluid, has reduced energy consumption along with improvement in the system performance under similar conditions of system operation.

The **ROI** for Hydromx will be about **34 months** under the present conditions of system operation.

ABOUT HYDROMX

WHAT IS HYDROMX?

HYDROMX is **heat transfer fluid empowered with Nano-particles.**

HYDROMX contains stably suspended Nano-particles to increase the speed of heat transfer.

HYDROMX is the only patented energy saving heat transfer fluid across the globe

HYDROMX is most suitable for closed-loop hydronic heating and Cooling systems.

- **pH value:** -8.2 – 8.6
- **Freezing point:** - 61°C
- **Boiling point:** -118°C
- **Density:** -6% denser than water

USP

- ONLY heat transfer fluid based on nano technology.
- Life cycle of 15 to 20 years.
- Heat transfer coefficient better than water by 37.4%.

***GALAXY ENERGY SOLUTIONS LLP,
(GES) is the exclusive distributor of
Hydromx across India.***

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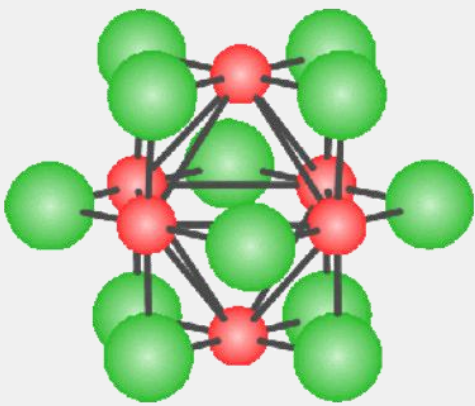
Ph.D., UNQC-QIP (Japan)

HOW IT WORKS?

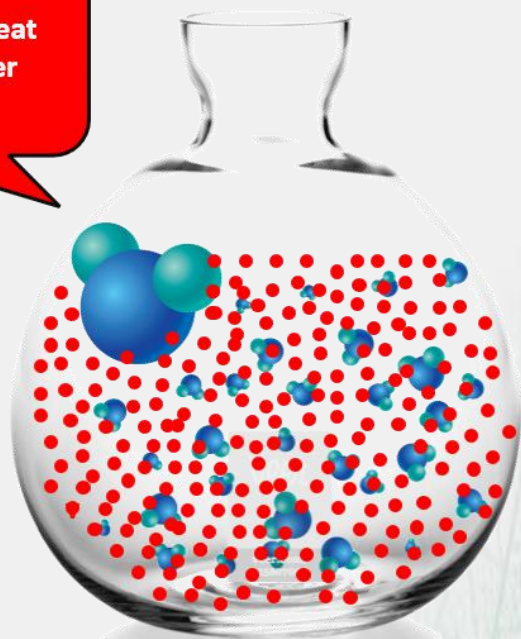
Hydromx® uses leading-edge Nano-Thermo™ Technology and a protected formulation to improve heat transfer. It rearranges the molecular structure of the fluid improving thermal conductivity and works in concert with the room/radiator thermostats and the boilers controls to reduce energy consumption. By transferring heat more efficiently the system heats up more quickly. As a result thermostats turn off sooner and the boiler modulates or changes its on/off cycle to save energy. There is a lot of complex science operating at the nanotechnology level, but in summary it really is that simple. It is used with water (Hydromx : water as 50:50)

Best of Both Worlds

Nano particles enhance heat transfer capacity of water



Structure of a solid metal



When water is used with 

BENEFITS

with use of Hydromx as heat transfer fluid the benefits are:



**Lesser Energy
consumption**

**Reduced Co₂
Emission**

Recyclable

**Environmental
Friendly**

**Life
Expectancy
15-20 Years**

**Protects
Against-
Scaling,
Corrosion,
Bacteria &
Frost**

PRODUCT

Hydromx is best suited for closed loop heating and cooling systems. The efficiency of the system increases due to diminishing run-time of associated equipment. Hence drastic increase in equipment life is achieved along with lesser maintenance cost.

The Hydromx provides the multiple benefits mentioned in the table given below; in addition to the fact that it is a better heat transfer medium in comparison to water.

Table: Multiple Benefits of Hydromx

One Solution - Many Solutions				
Features	Water	Chemical Inhibitor	Antifreeze	
Energy Saving Up To 35%	X	X	X	✓
System Protection	X	✓	X	✓
Freezing Protection	X	X	✓	✓
Bacteria, Corrosion, Calcification	X	✓	X	✓

Hydromx provides great benefits on environmental impacts calculated when compared to brine/water and ethylene glycol systems due to energy savings achieved during the use phase.

Hydromx when used with water in the ratio of 50:50 enhances the capacity of water to transfer heat. Thus, makes it more efficient in terms of energy consumption.

The Schematic diagram showing the working of Hydromx in the chiller is presented in the figure given below.

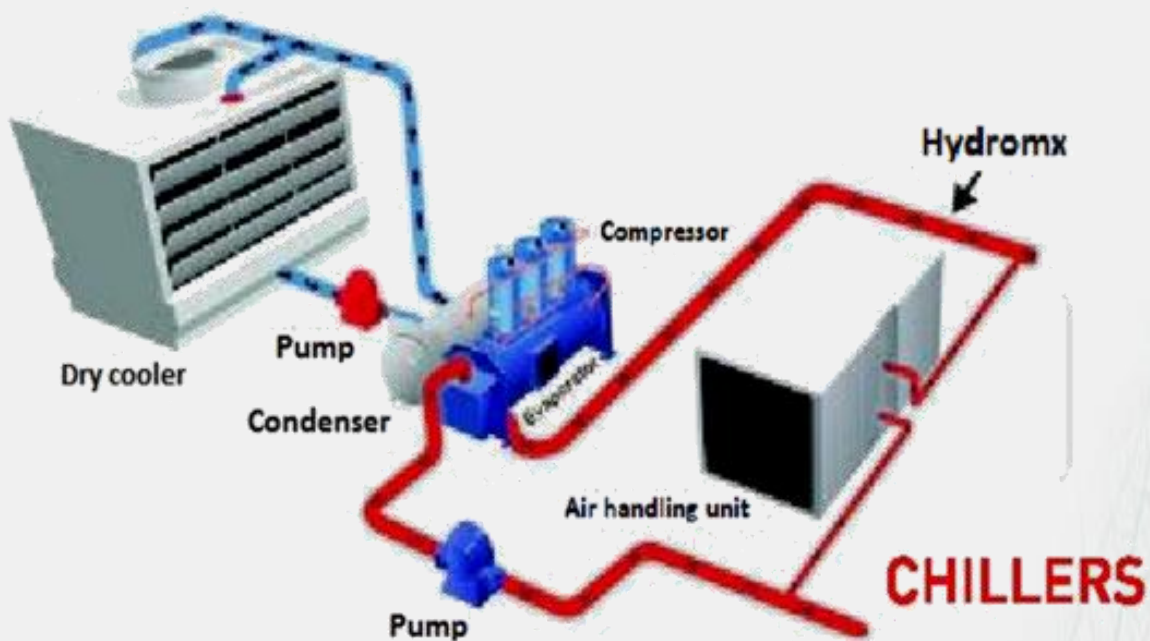


Fig.: Schematic diagram showing the working of Hydromx in the chiller

ADDITIONAL ADVANTAGES

- **Anti-freeze:** protects the system against freezing.
- **Life cycle:** Thus, product has 15-20 years life cycle for its 1st use.
- **No shut down is required:** The equipment does not need any frequent shut-downs for dosing of inhibitors, which were otherwise happening when water was used as heat transfer medium.
- **No inhibitors:** Hydromx itself also acts as an inhibitor.
- **No retrofit :** Hydromx can be used in the system without any rectification or modification in the equipments.
- **Reusable:** Hydromx used in one system can be reused / transferred on another system, if required.
- **Recyclable:** This product is ready for reuse after its life cycle by processing it through recycling.

SAFETY INSTRUCTIONS AT SITE

Please dont drain Hydromx this is because the expected life of the product is 15 – 20 years.

SMS - PROJECT

INTRODUCTION



Unit: SMS Hospital

Address: Sawai Ram Singh Road, Jaipur – 302004;
Rajasthan, INDIA

Phone: +91 141 2565647

SMS MEDICAL COLLEGE & ATTACHED HOSPITAL, JAIPUR



ABOUT SMS

Sawai Man Singh Medical college and Hospital completed year-long celebrations of completing 70 years of coming into existence on 7th April 2018. The celebrations were for its success story of becoming a prominent government-run medical college in north India.

Ecstatic SMS Hospital officials looked satisfied over their success in bringing high-tech and modern facilities to the hospital such as bone-marrow transplant and organ transplant facilities, but they also promised that many more such projects were in the pipi-line.

A 14-storey building for multiple super specialties will come up near Institute of traumatology and orthopaedics. The centre will develop the unit for super specialties.

Institute of organ transplant will be developed to give boost to organ transplant at SMS Hospital. The SMS Hospital had started cadaver liver transplant and it has yet to foray into heart transplant. Skin bank is also proposed which will be useful for skin transplant.

BACKGROUND

SMS's legacy began with one hospital and a dispensary in 1845. A maternity hospital and another dispensary were added in 1855 in Jaipur.

A medical school was inaugurated on 7th September 1861 with Dr Kingford Burr as director of this college.

On March 13th 1946 Lord Wavell laid the foundation stone of SMS college in a very impressive function presided over by HH Sawai Man Singh, the Maharaja of Jaipur. The year 1947 marked the beginning of a new era in medical education in Rajasthan with the inception of the 15th centre for medical education in India; the prestigious Sawai Man Singh Medical College. Dr G N Sen was its first principal. He had a short tenure and was succeeded by Dr S C Mehta famous for his great zeal, drive and sense of discipline.

In 1952 the college was recognized by the Medical Council of India and the foundation of a new OPD block was laid in the succeeding year. 1952 also marked the beginning of PG Courses and the first batch of MD and MS students qualified in 1955.

SMS – THE SITE

The Hospital Management has installed for its CTOT two chiller units with an AHU

The system details are as follows:

Chiller : 01 operational

Chiller : 01 stand-by

Capacity: 22.7 TR each

Make: BLUE STAR

Supply temperature: (AHU - In) 11° C

Return temperature: (AHU - Out) 18° C

Cooling area: Cooling of CTOT area

CTOT temperature maintained 17°C to 19° C

Working hours for chiller: as per OT requirement
(8 hours/day for 300 days)

**System capacity including
make-tank:**

470 litres

Fluid flow pump rating:

70 GPM

Location of chiller:

Terrace level

Unit monitoring method:

kWH

Rate of electricity:

INR 8.00 per unit

Total water vol.:

about 470 litre

Hydromx used:

240 litres (Hydromx) + 230
litres (water) (Hydromx:
water: 52: 48)

Date of Data Logger Insatallation:24th November 2017

SITE DESCRIPTION

The various OT units and patient wards of SMS Hospital are covered with air-conditioning system through AHUs with chiller, which is providing cooling effect to the demand of the various OT units and patient wards. The AHU unit monitored, for the present case study, is AHU- with 6000 CFM (for CTOT unit). AHU system along with Chiller unit are connected to the logger unit for continuous measurement and recording of various data relevant to the analysis. The parameters recorded are at an interval of one minute; however, it is summarized on daily basis. The parameters are operating hours, energy consumption (kWh/day), supply & return temperatures, ambient temperature, etc. Hydromx was mixed with water which makes a ratio of 52:48 in the solution when installed into the system.

There are number of AHUs and Chillers installed on the terrace of the main building for maintaining the desired temperature in their operation theatres and necessary wards such as emergency ward.

SMS Hospital has adopted AHU units for better temperature control of their OTs. The system in the present case study relates to that of CTOT. The water in the system acts as heat transfer medium. It circulates at the rate of 70 gallons per minute (gpm) between the evaporator of the chiller unit and its AHU using a fluid pump. This makes a closed loop system for the heat transfer medium to take away the heat from the AHU installed for maintaining desired temperature in the Operation Theatre (OT) of their CT unit. The SMS Hospital was using WATER as the heat transfer fluid prior to the recommendations of Galaxy *Energy Solutions* LLP for application of HYDROMX as a medium of heat transfer for energy saving along with added benefits.

METHODOLOGY

This document reports on the findings and data analysis relating to performance data, before and after installation of Hydromx as the heat-transfer fluid in the closed loop system of the chiller unit. The chiller unit is providing cooling effect to the water in the circulation in closed loop between the chiller units and the AHU. The chilled water is supplied to meet the demand of the AHU for maintaining the desired temperature in the CTOT unit of the hospital. This report specifically investigates the performance data trends before and after installation of Hydromx and utilize academic knowledge and expertise to verify the saving in energy consumption and cost calculations with an overall aim of delivering a view of the system performance before and after Hydromx was installed.

The data collected had been monitored and acquired in two stages:

1. Before Hydromx was installed, and
2. After the Hydromx was installed

A number of energy saving assessment methods are examined to compare the normal operating condition of the system, when water was used as heat transfer fluid in the cooling system with that of the system using Hydromx as heat transfer fluid, in order to identify overall trends in energy savings and assess, an indication of whether significant changes have occurred in the operation of the system affecting the energy consumption. The financial and energy benefits of installing the product have been looked at.

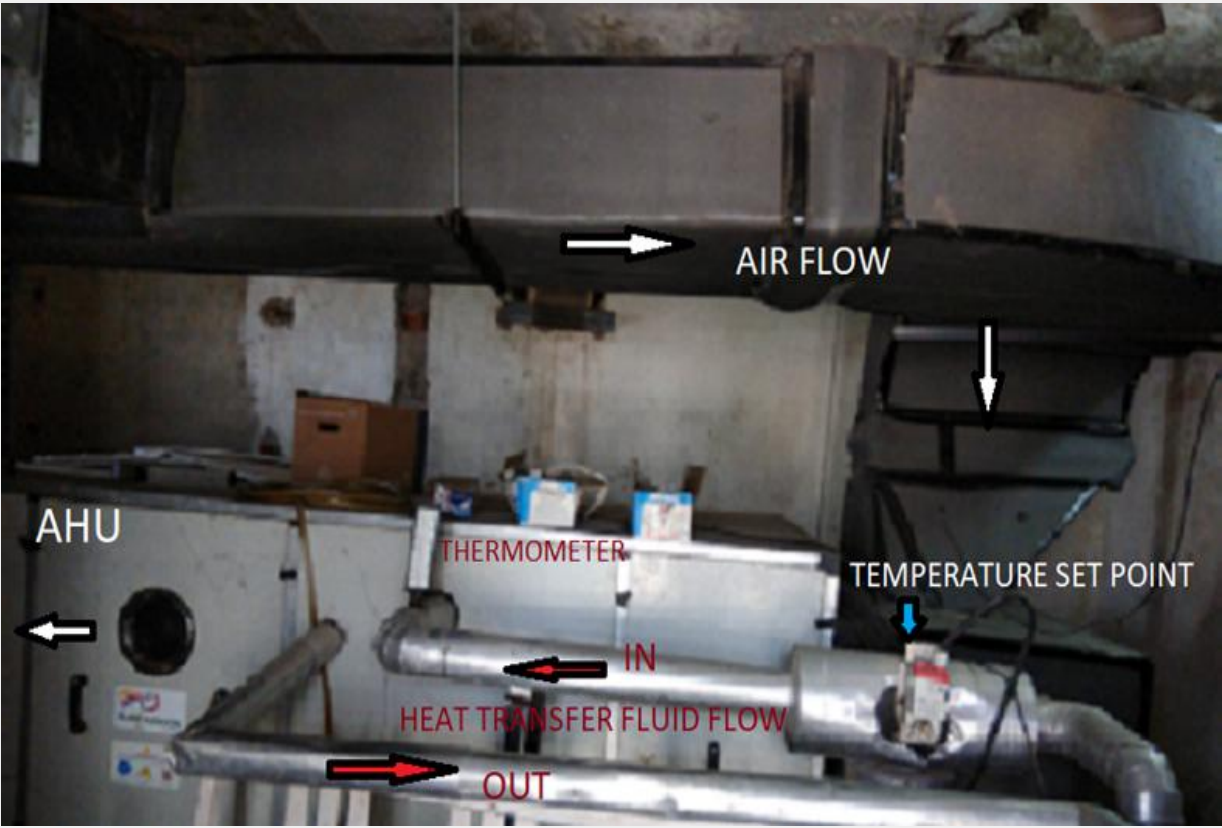
HYDROMX INSTALLATION AT SITE

The original design and construction of piping system; for supply and make-up of heat transfer fluid for its loss during the process operation, was done keeping in view that water is a medium of heat transfer and can be discharged and recharged as required. However, with replacement of water by Hydromx as heat transfer fluid, we cannot afford to lose Hydromx in discharge from the system. Hence a modification in the system is necessary. The water supply pipe-line to the makeup tank is disconnected directly to ensure that no water is supplied to the make-up tank even by mistake. This is because water in the make-up tank has been replaced by Hydromx. The life of Hydromx solution is expected for around 15 years.

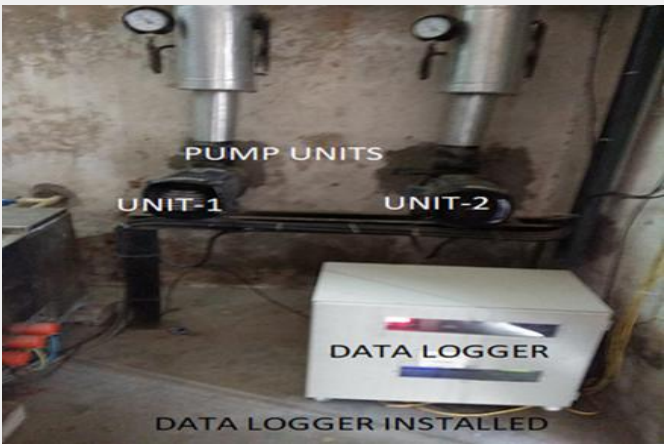
A data logger was installed in the month of November 2017 in consultation with the Hospital services management team of state PWD, Govt. of Rajasthan. The raw data has been collected from November 25, 2017 for parameters related to temperature, RH, Run time and fuel consumption etc. During this period, water was the medium of heat transfer between the chiller unit and AHU.

Hydromx was introduced as a heat transfer medium in the system on April 8, 2018 and data are recorded through data logger from April 9, 2018. The various activities of installation are presented in the photographs below.

HYDROMX INSTALLATION UNDER PROCESS



AHU UNIT OF THE SYSTEM



FLUID FLOW PUMP UNITS



GALAXY ENERGY SOLUTIONS' TEAM AT WORK ON SITE

DATA SUMMARY SHEET

THE DURATION TRIAL DATA: 12 DAYS

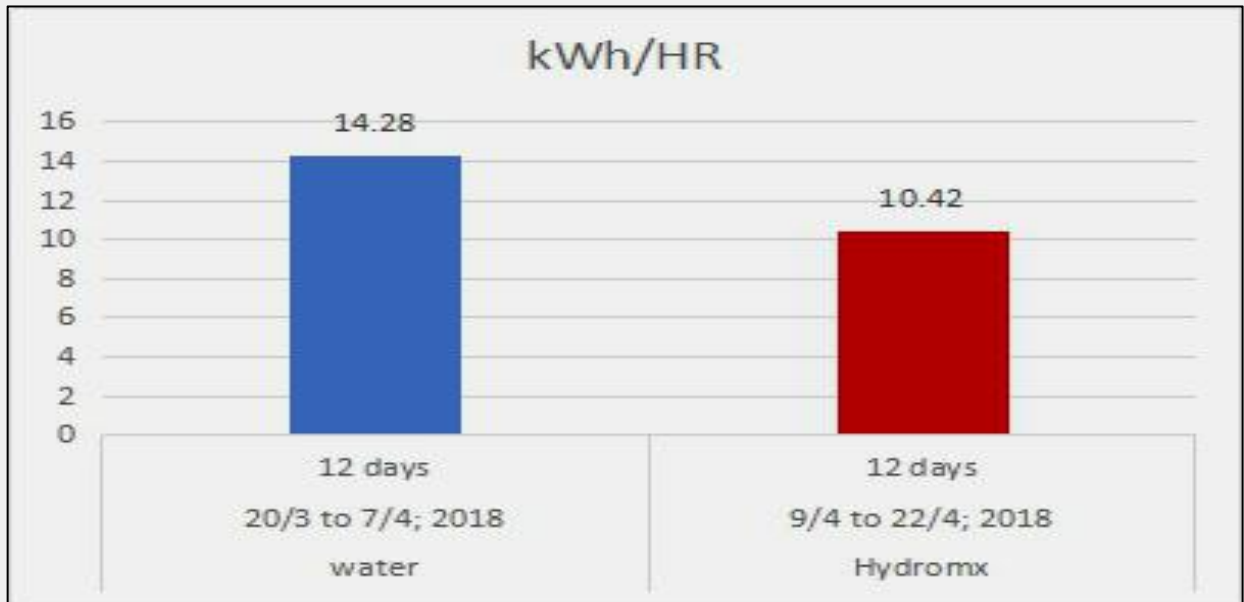
SMS HOSPITAL, JAIPUR 22.7 TR X 2 TR BLUE STAR CHILLER		
DAYS	12 DAYS	12 DAYS
RUN TIME	111.8	81.91
KWH	1596	853.3
KWH/HR.	14.28	10.42
SUPPLY TEMP . °C	6.73	6.58
RETURN TEMP . °C	8.50	8.4
DELTA °C	1.77	1.82
FLOW RATE GPM	70	70
TR	9.29	9.56
TOTAL TRH	1038.9	782.7
IKW/TRH	1.54	1.09
COP	2.29	3.2

UNIT CONSUMPTION PER HOUR REDUCED BY 27%
UNIT CONSUMPTION PER TR REDUCED BY 29%


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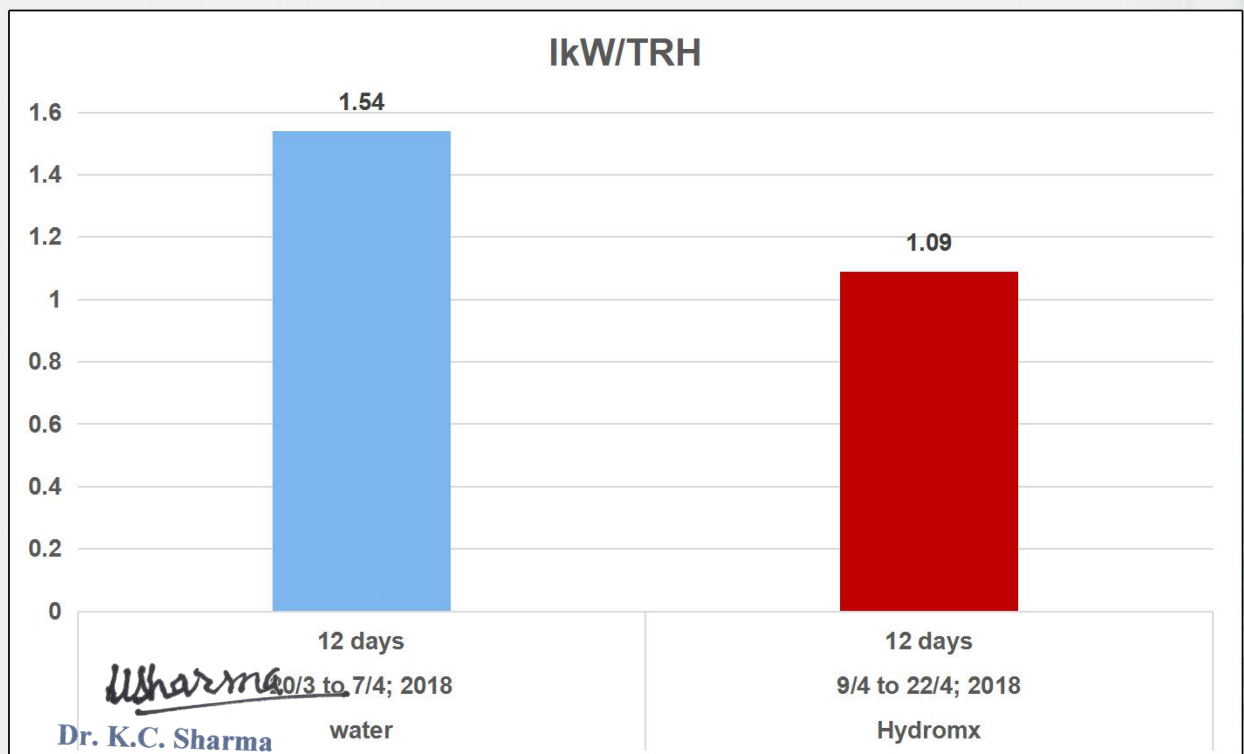
A: Energy units consumption per hour

Parameter	Water	Hydromx
	20/03 to 07/04; 2018	09/04 to 22/04; 2018
	12 days	12 days
kWh / HR	14.28	10.42



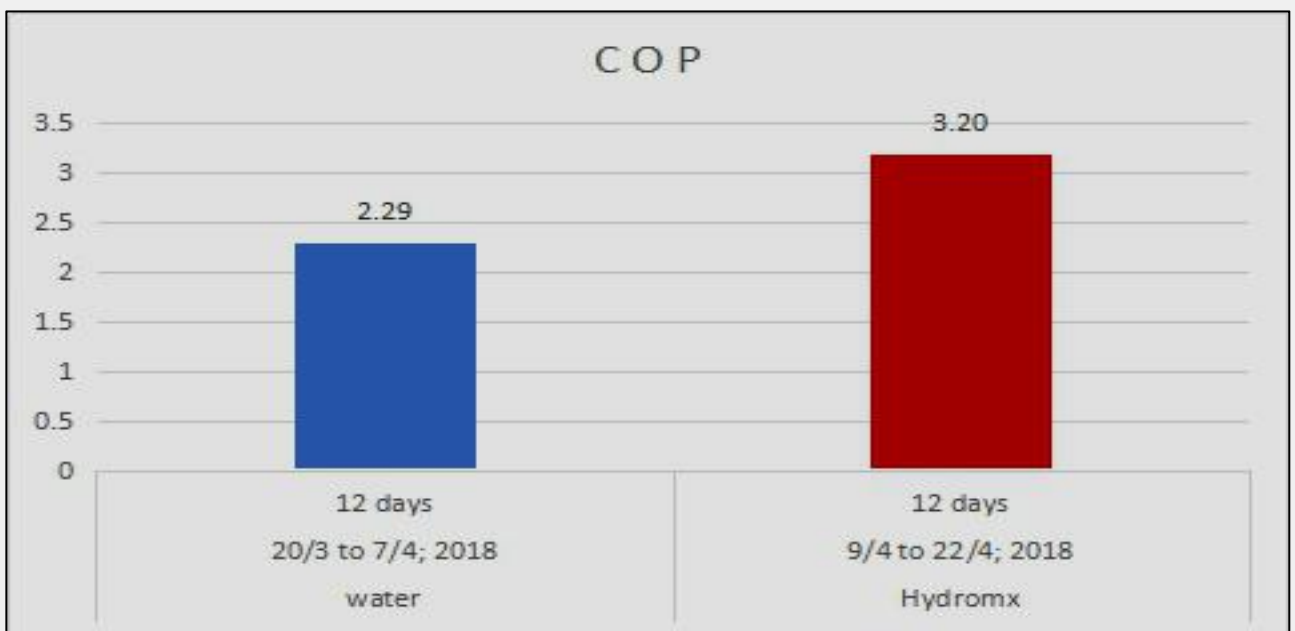
B: Energy units consumption per TRH

Parameter	water	Hydromx
	20/3 to 07/04; 2018	09/04 to 22/04; 2018
	12 days	12 days
IkW / TRH	1.54	1.09



C: Performance parameter (C O P)

Parameter	water	Hydromx
	20/03 to 07/04; 2018	09/04 to 22/04; 2018
	12 days	12 days
C O P	2.29	3.20



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D: REDUCTION IN ENERGY CONSUMPTION

&

SAVINGS AS PER ACTUAL CONSUMPTION DATA

The following data have been arrived at for the operational conditions of the chillers for analysis of the savings:

- cooling load / day = 10 TR/HR
- Average run time / day = 8 hours
- Working days / year = 300 days
- Energy charges = Rs. 8 / kWh

SAVINGS AS PER ACTUAL POWER CONSUMPTION DATA

IF WE TAKE AVERAGE COOLING LOAD PER DAY	10.00	TR/HR.
KWH CONSUMPTION ON WATER IS (10 X 1.54)	15.36	KWH/HR.
KWH CONSUMPTION ON HYDROMX IS (10 X 1.09)	10.90	KWH/HR.
AVERAGE PER DAY RUN TIME	8.00	HR./DAY
CONSUMPTION ON WATER (15.36 X 8 RUN TIME X 300 DAYS)	36,869.71	KWH
CONSUMPTION ON HYDROMX (10.9 X 8 RUN TIME X 300 DAYS)	26,166.48	KWH
YEARLY SAVINGS	10,703.23	KWH
RATE OF ELECTRICITY	8.00	PER KWH
AMOUNT SAVED IN A YEAR	85,625.83	

YEARLY ENERGY CONSUMPTION ; kWh



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DATA SHEET

DATA SHEET

Date	Run Time (Data Logger)	Energy consumption (kWh/day)	KW/Hr	PHE		Delta t.	TRH		COP	AHU			Amb Temp
				A.SUPPLY TEMP *C	A.return TEMP.*C		TR	IKW/TRH		A.SUPPLY TEMP *C	A.RETURN TEMP.*C	Delta t.	
3/20/2018	5.42	76.00	14.02	6.27	8.27	2.00	9.75	52.85	1.44	10.58	16.79	6.21	29.70
3/21/2018	3.90	55.00	14.10	6.66	8.67	2.01	9.80	38.22	1.44	11.12	16.38	5.26	26.63
3/28/2018	4.85	73.00	15.05	7.61	9.59	1.98	9.65	46.81	1.56	12.15	19.47	7.32	33.98
3/29/2018													
3/30/2018	20.54	310.00	15.09	6.61	8.57	1.96	9.56	196.26	1.58	10.83	17.91	7.08	31.12
3/31/2018	19.69	292.00	14.83	6.69	8.63	1.94	9.46	186.22	1.57	11.14	17.60	6.46	30.79
4/1/2018	10.20	155.00	15.20	6.38	8.31	1.93	10.13	103.35	1.50	10.20	16.16	5.96	27.02
4/2/2018	10.31	158.00	15.32	6.71	8.42	1.71	8.98	92.56	1.71	10.93	18.72	7.79	33.40
4/3/2018	6.86	95.00	13.85	6.76	8.28	1.52	7.98	54.74	1.74	10.81	18.62	7.81	33.36
4/4/2018	7.43	90.00	12.11	6.80	8.26	1.46	7.67	56.95	1.58	10.59	18.07	7.48	32.12
4/5/2018	7.61	98.00	12.88	6.72	8.21	1.49	7.82	59.53	1.65	10.74	18.98	8.24	34.28
4/6/2018	7.02	89.00	12.68	6.88	8.33	1.45	7.61	53.44	1.67	10.57	18.49	7.92	32.13
4/7/2018	7.97	105.00	13.17	6.70	8.29	1.59	8.35	66.53	1.58	10.42	17.76	7.34	30.94
12 days	111.80	1596.00	14.28	6.73	8.50	1.77	9.29	1038.90	1.54	10.84	17.91	7.07	
HYDROMX INSTALLED (240 LTS) 52 % : 48 % (HYDROMX : WATER)													
4/8/2018													
4/9/2018	8.71	95.00	10.91	6.85	8.71	1.86	9.77	85.05	1.12	11.00	18.35	7.35	31.36
4/10/2018	6.50	66.00	10.15	6.70	8.30	1.60	8.40	54.60	1.21	10.70	16.50	5.80	27.00
4/11/2018	7.60	77.00	10.13	6.40	8.10	1.70	8.93	67.83	1.14	10.30	18.90	8.60	28.50
4/12/2018	5.90	63.00	10.68	6.30	8.00	1.70	8.93	52.66	1.20	10.60	16.60	6.00	24.50
4/13/2018	3.50	37.00	10.57	6.22	7.71	1.49	7.82	27.38	1.35	11.20	18.30	7.10	32.50
4/14/2018	4.35	46.00	10.57	6.65	8.43	1.78	9.35	40.65	1.13	10.50	18.50	8.00	34.00
4/15/2018													

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4/16/2018	7.92	78.00	9.85	7.00	8.76	1.76	9.24	73.18	1.07	3.30	10.40	18.80	8.40	
4/17/2018	7.12	71.71	10.07	6.52	8.57	2.05	10.76	76.63	0.94	3.76	11.27	18.82	7.55	31.85
4/18/2018														
4/19/2018	7.89	82.44	10.45	6.75	8.70	1.95	10.24	80.77	1.02	3.45	11.68	20.36	8.68	34.26
4/20/2018	10.61	111.11	10.47	6.67	8.57	1.90	9.98	105.83	1.05	3.35	11.28	18.60	7.32	31.73
4/21/2018	7.62	80.08	10.51	6.64	8.62	1.98	10.40	79.21	1.01	3.48	11.05	18.30	7.25	30.08
4/22/2018	4.19	45.97	10.97	6.27	8.29	2.02	10.61	44.43	1.03	3.40	10.90	17.00	6.10	26.76
12 days	81.91	853.31	10.42	6.58	8.40	1.82	9.56	782.65	1.09	3.23	10.91	18.25	7.35	

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CONCLUSION

The application of Hydromx as heat transfer fluid in place of water with 22.7-ton BLUE STAR Chillers has reduced energy consumption resulting in the savings of energy bills along with improvement in system efficiency and reduction in carbon emission (a need of the hour to reduce global warming). The savings achieved are based on 12 days data analysis.

The CTOT area is not operational for continuous use. Therefore, the run-time of chillers is approximated to the following operational conditions.

- | | |
|---------------------------|---------------|
| 1. cooling load / day | = 10 TR/HR |
| 2. Average run time / day | = 8 hours |
| 3. Working days / year | = 300 days |
| 4. Energy charges | = Rs. 8 / kWh |

The savings achieved under these conditions of operation are-

1. The energy consumption per hour has been reduced by 27%
2. The reduction in energy consumption per TR is 29%
3. The system efficiency (COP) has improved by 41%
4. The amount saved per year is Rs. 85,625/-
5. ROI is about 34 months

The additional benefits with the use of Hydromx as heat transfer fluid are:

1. Reduction in carbon emission is 85624 kg CO₂ per year for yearly energy saved of the order of 10703 kWh units.
2. The system is protected against scaling, corrosion, calcification etc.

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CREDITS



Mr.Alok
(Pr. Secretary PWD, Govt. of Rajasthan)

He has played the key role in adopting the emerging technology of Nano Particle Fluid for reducing Co₂ Emission in highly efficient cooling systems and saving energy bills as well.

“From a commercial and environmental standpoint, implementing Hydromx – energy saving nano fluid made absolute sense. Once my team ensured that Hydromx fits green technology, high standards of performance & cost-benefit parameters, I approved the first installation of Hydromx at The Sawai Man Singh Hospital, Jaipur. Now, after seeing these results, I am happy that my trust in Hydromx has not been misplaced.”



Mr. Jagat Singh Meena
(Additional Chief Engineer (Elect) PWD, Jaipur)

He has been the real force to implement this project and also understood the importance of energy efficiency during their discussion with GalaxyENS team. After that he went ahead with the installation of Hydromx.

“Hydromx has helped us manage and minimize the impact on the environment by reducing the use of electricity as efficient management of energy in our chiller system. Hydromx Team India, led by Mr. Surendra Bohra has done a good job matching our expectations for the project.



Mr. Arvind Khatri

**(Executive Engineer Electrical Division SMS Medical College,
PWD, Jaipur)**

He assisted us to move ahead with the implementation of Hydromx by giving proper navigation and aspects of their system to make energy efficient.

“We have observed the performance of Hydromx and hope it will continue to perform in future also. Hydromx helps us to reduce the CO2 emission by reducing the energy consumption.”



Mr. M.L. Meena

**(Assistant Engineer Electrical Sub Dn SMS Medical College
Ist, PWD, Jaipur)**

“ Hydromx with its unique property will eliminate many problems like scaling, corrosion and calcification which we used to face earlier.”



Mr. Gaurav Sharma

**(Junior Engineer Electrical Sub Dn SMS Medical College
Ist, PWD, Jaipur)**

“ Hydromx, as mentioned, is most suitable for closed-loop heating and cooling systems. At the same time it also drastically reduces the consumption of water as the life expectancy of the Hydromx is 15-20 years.”

CASE STUDY PREPARED BY:



Dr. K.C. Sharma
**(B.E.(Mech.), MTech. (IIT, Mumbai), Ph.D., UNQC-
QIP(Japan) Fellow: FIE, ISTE, SAE)**
Consultant: Galaxy Energy Solutions, Jaipur

Dr. K.C. Sharma, consultant to Galaxy Energy Solutions, is a retired Professor of Mechanical engineering with more than 45 years of experience in the areas of academics and industries. The experience relates to the disciplines of Research and Development, Production processes, Quality management, and consultancy services

As an academician, he served over 22 years in various institutions including SVNIT Surat. He was Director of the Engineering Faculty in MGCG University, Chitrakoot (MP).

Mr. Sharma acquired quality management skill through international courses organized by Govt. of Japan and UNIDO. He attended number of national seminars and workshops as well. He also has to his credit number of papers published in national and international seminars and journals. He is a member / fellow of technical societies and institutions.



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Thank You



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