Heta Datain

Profile

Energy Optimisation and Productivity Monitoring using Simulation Techniques

HETA DATAIN, NAGPUR, INDIA

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CONTENTS

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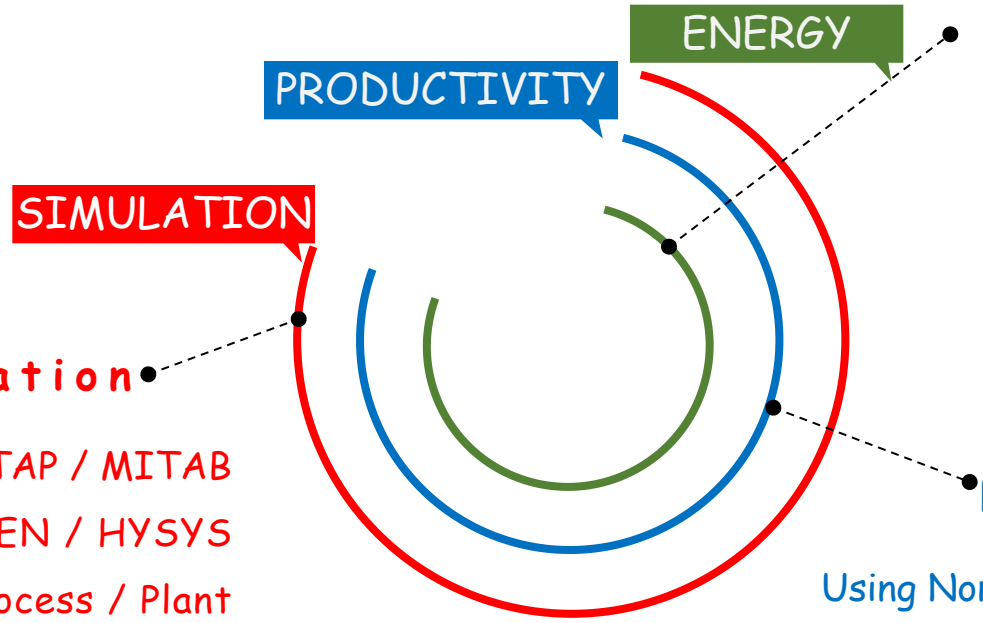
Area of Expertise

Energy Audit / Energy Optimisation / Productivity Monitoring / Production Optimisation / Energy Intensity / Process and Equipment Simulation
Embedded Dataloggers , Industry 4.0, Wireless communication, Cloud Computing , Real Time Dashboards and APP, Management Information and Business Intelligence Reports



Real Time Energy Optimisation

Using Non-Invasive Sensors and Dataloggers, we log Energy parameters from each Feeder / Equipment without any Outage. This data is analysed for the Energy Map of the Process / Equipment for Energy Optimisation.

Process Simulation

Using Simulations Software like ETAP / MITAB / ANSYS / MATLAB / NI / ASPEN / HYSYS etc, we simulate the complete Process / Plant Equipment using design parameters, and then we tweak the individual equipment behaviour to replicate present scenario.

Real Time Productivity Monitoring

Using Non-Invasive Sensors and Embedded Dataloggers, we log necessary Production parameters required for Productivity Monitoring in Real Time. We then map this data with Energy consumed to give Energy Intensity reports and analysis.

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How WE achieve Energy Optimisation

Doing Energy Audit is STATIC. It only gives the status of Energy efficiency based on the present parameters, and the remedies suggested are limited to that time scenario. Production, User Demand, Seasonal Weather, Occupancy variation etc. are parameters which vary every hour throughout the year, and this makes Energy Optimisation of these processes a very DYNAMIC exercise.

Energy related Data logging to the Cloud

Real Time Data using IOT, Data Loggers, Wireless, Cloud based Servers log Energy parameters in an non-invasive manner, without any outage. This system remains in place for a year.

Off-Shore Process Simulation

Design, Equipment and Process details are mapped with the Energy parameters logged, and the complete User Process / Plant is simulated on high end Computers to visualize the actual status and efficiency.

Dashboard & APP for status of Energy Flow

Users get a dashboard showing near Real Time status of Process / Equipment efficiency, to take corrective action IN-TIME and not post-mortem.

Expert advice on Process Flow during the year

Expert Energy Managers analyse the simulated data off-shore, and continuously update for "area of concern" and "process philosophy" changes. Host of reports, trends, and analysis are sent on a daily basis

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How WE achieve Productivity and Energy Optimisation

Real Time Monitoring of Machine Production, Running / Idle / Breakdown / Stoppage time and Energy parameters simultaneously, gives enough data to map the Energy Intensity of each Machine / Process. Off-shore simulation of this system gives co-relation between different process parameters gives a tool for increase in Productivity and Energy Optimisation of the system

Production & Energy related Data logging to the Cloud

Real Time Data using IOT, Data Loggers, Wireless, Cloud based Servers log Energy parameters in an non-invasive manner, without any outage. This system remains in place for a year.

Off-Shore Process Simulation

Design, Equipment, Production and Process details are mapped with the Energy parameters logged, and the complete User Process / Plant is simulated on high end Computers to visualize the actual status and efficiency.

Dashboard & APP for status of Productivity and Energy Flow

Users get a dashboard showing near Real Time status of Process Productivity / Equipment efficiency, to take corrective action IN-TIME and not post-mortem.

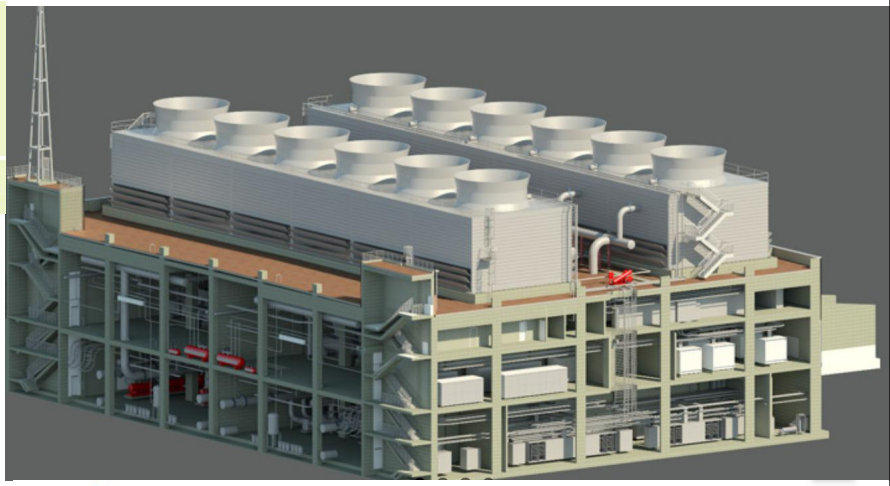
Expert advice on Process Flow during the year

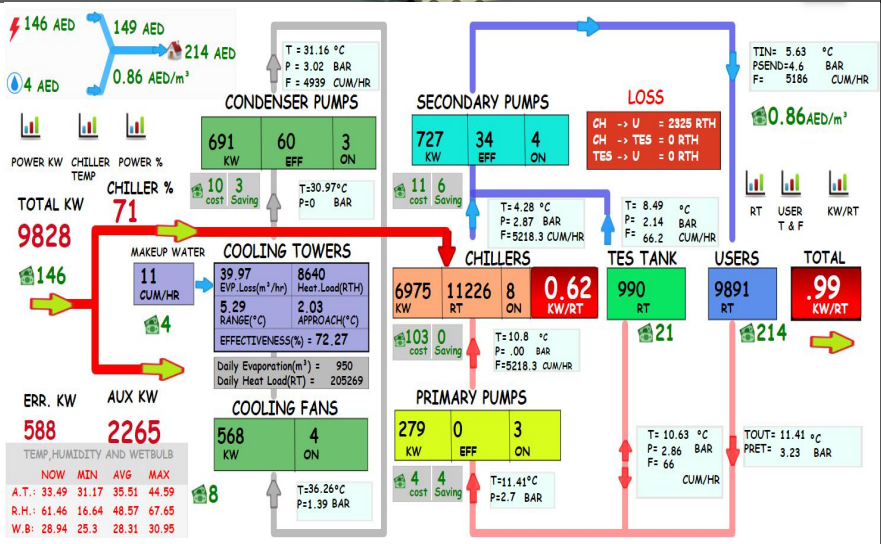
Expert Production Engineers and Energy Managers analyse the simulated data off-shore, and continuously update for "area of concern" and "process philosophy" changes. Host of reports, trends, and analysis are sent on a daily basis

Energy Optimisation of District Cooling Plant

Works Executed or Work in Progress

Located in United Arab Emirates, DUBAI





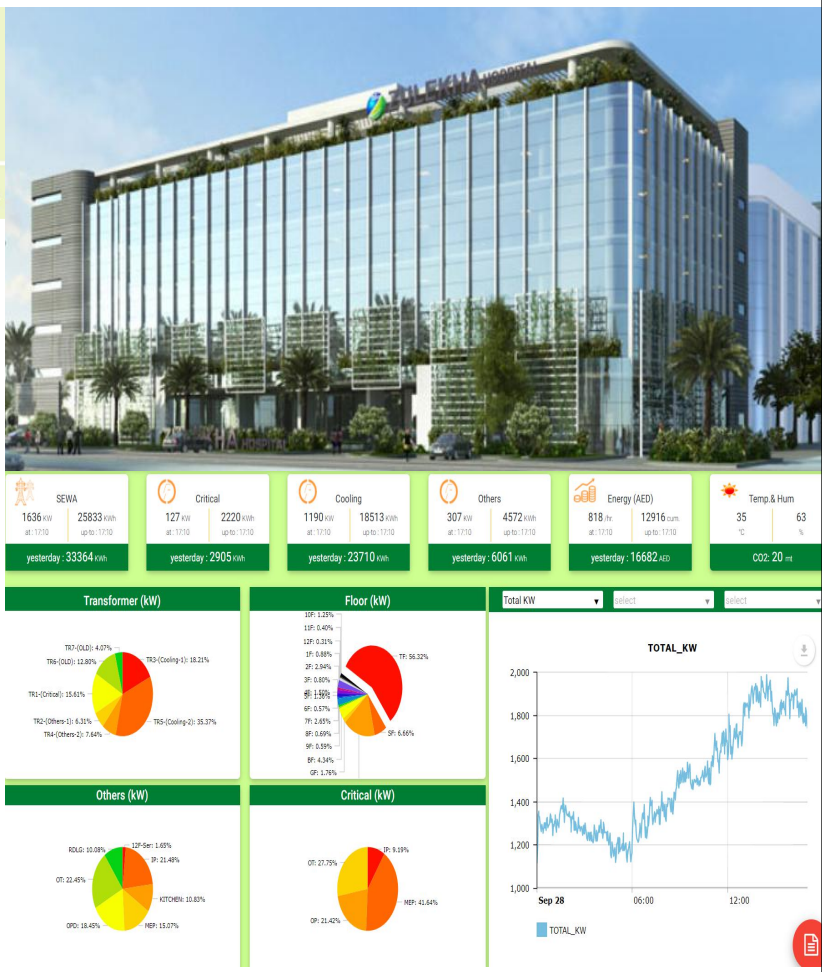
- ✓Process Philosophy Changed to achieve Energy Optimisation after Computer Simulation of 24 month data from 746 tags every 2 minutes, or **400 million data points**
- ✓No CAPEX was done.
- ✓Result achieved was increase of RT/CUM from 1.02 to 1.57, giving a saving of **AED 7 million per year**.
- ✓Targeted increase will be 2.25 RT/CUM, giving a saving of AED 15 million per year

3 District Cooling Plants work in progress totaling 81,250 TR

AIRCON Energy Monitoring of Hospitals

Works Executed or Work in Progress

Located in United Arab Emirates



185 and 176 Bedded Hospitals with IPD and OPD

- ✓Logging of 90 Feeders and analyzing **6 million Electrical Parameters** every day. Uploading these to the Cloud every minute
- ✓Simulation of last 12 months data of these feeders to create an OFF-SHORE replica of the Hospitals
- ✓Based on the analysis, Process Changes were recommend to achieve Energy Optimisation
- ✓No CAPEX was done and Maintenance cost has been reduced due to Smoother operation of the System
- ✓Alerts, Early Warning reports, and misuse Alarms **reduced the Electrical consumption to 11.8%** of the last years value on basis of M&V.

AIRCON Energy Monitoring of Hospitals

W o r k s E x e c u t e d

Located in INDIA

1200 Bedded Hospitals with IPD and OPD

- ✓Logging and Monitoring **256** Central, Split and Window Mounted **Air Conditioners for 134 million** parameters per year. Data sent to the cloud every minute.
- ✓Compressor Loading/Un-loading time breakup, Energy Consumption, and Cooling Temperature was monitored
- ✓No CAPEX was done.
- ✓Maintenance cost has been reduced dramatically due to fore-warning of Aircon working parameters.
- ✓Alerts, Early Warning reports, and misuse Alarms **reduced the Electrical consumption to 42%** of the last years value.

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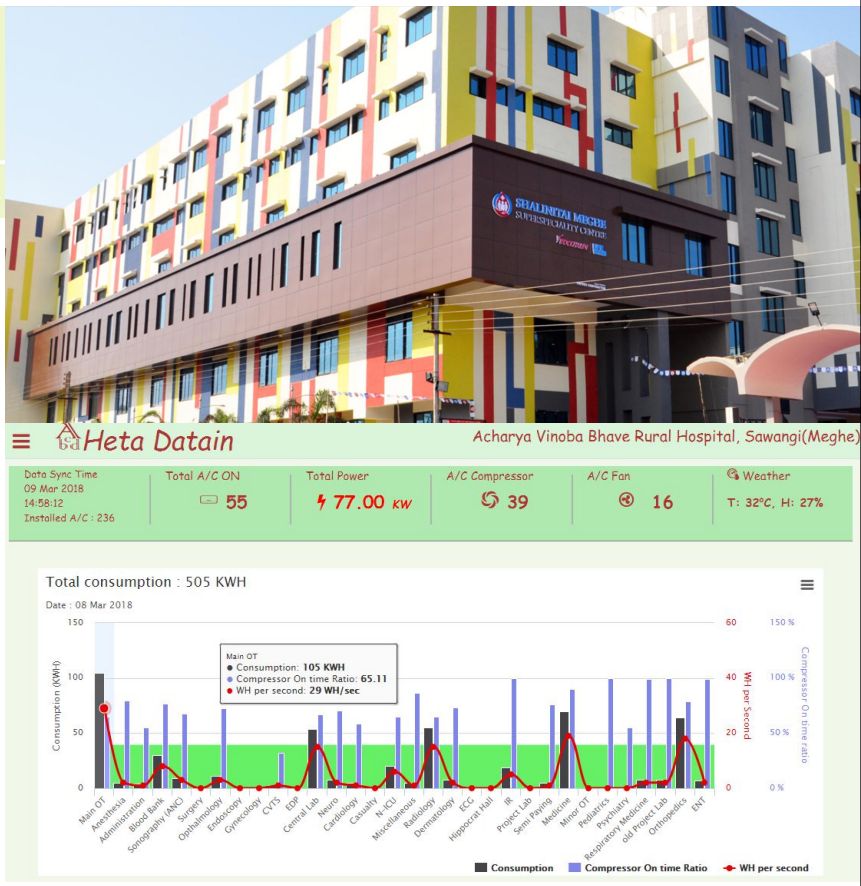

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Productivity and Energy Monitoring of Manufacturing Industry

Works Executed in INDIA

Vacuum Forming for Automobile Industries

- ✓Logging and Monitoring **16 VF Production Machines for 1 million data** parameters per day. Data sent to the cloud every minute.
- ✓Each Machine Running/ Idle / Breakdown / Stoppage time breakup, and Energy Consumption was monitored
- ✓No CAPEX was done.
- ✓Productivity has improved since all stake holders are monitoring Real Time status and not post-mortem.
- ✓Alerts, Early Warning reports, and misuse Alarms **reduced the KWH/Job to 18%** of the last years value.

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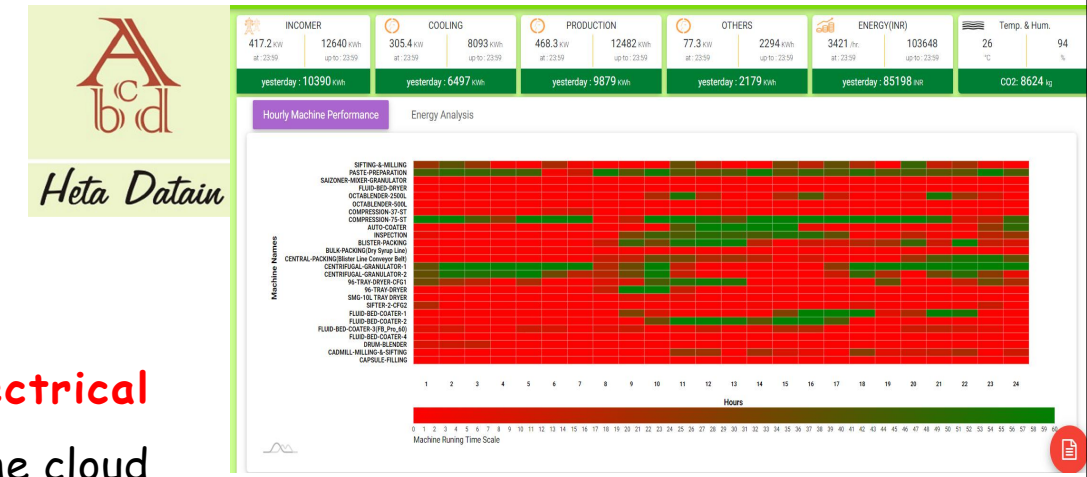
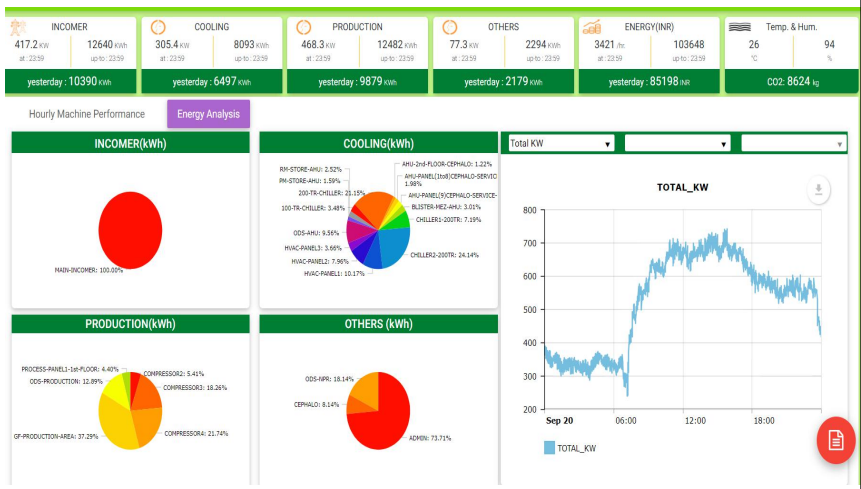
Productivity and Energy Monitoring of Pharmaceutical / Packaging Industry

Works Executed in INDIA



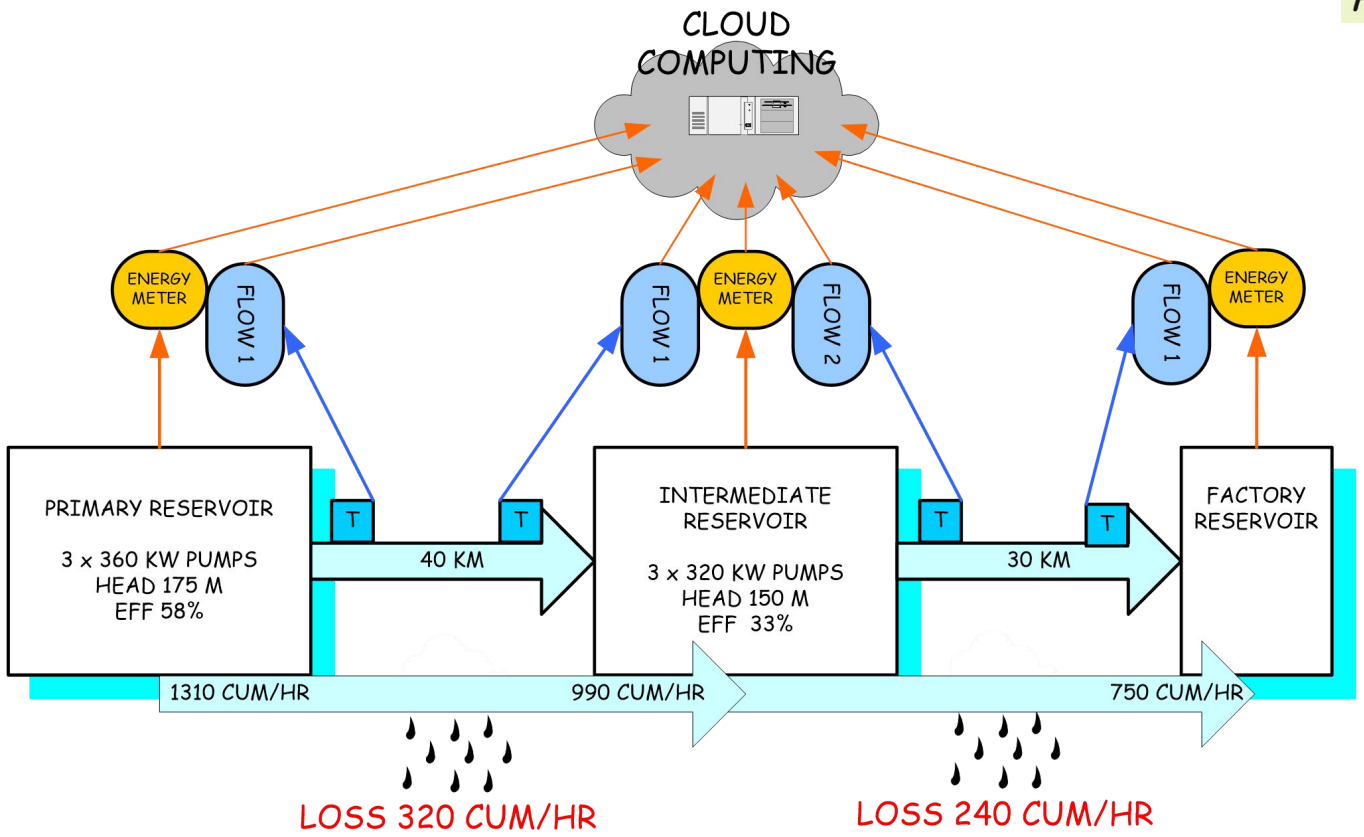


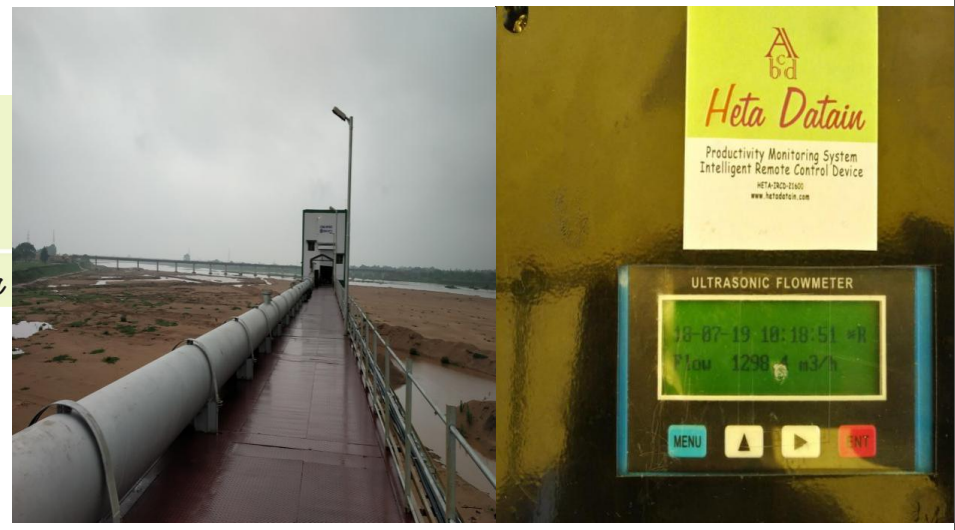
Medicine Making or Packaging Machines

- ✓Logging and Monitoring **26 Production Machines and 30 Electrical Feeders for 2 million data** parameters per day. Data sent to the cloud every minute.
- ✓Each Machine Running/ Idle / Breakdown / Stoppage time breakup, and Energy Consumption was monitored
- ✓No CAPEX was done.
- ✓Productivity has improved since all stake holders are monitoring Real Time status and not post-mortem.
- ✓Alerts, Early Warning reports, and misuse Alarms **reduced the Idle Time of Machines since** last years value.

Water Pumping and Pipeline Loss Audit using Synchronous Logging Techniques

Works Executed in INDIA





For a 70 KM long Pipeline designed to carry 1500 CUM/hr of water, only 750 CUM/hr water reached the source. The air was to improve the Pumping Efficiency, and locate the water leakage or pilferage. The pipeline was mostly underground, and passing through forest aera.
Simultaneously data logging of 4 flow meters and 6 Energy meters was done to acheive the outcome.

SIZE OF DATA HANDLED IN CLOUD COMPUTING				
Project Name	Project start Date	Data Size (GB)	MONTHS	DATA/MONTH (MB)
DCP7	Jun-17	20	27	741
DCP 136	Mar-18	2	18	111
ETS 136	Feb-19	7	8	875
ZHS	Feb-18	13	20	650
ZHD	Jun-18	8.5	16	531
AF	Oct-18	5	12	417
PANCHWATI	Jan-19	2	9	222
ZLL	Apr-19	5.5	5	1100
	TOTAL	**63 GB**	**115 MONTHS**	**4647 MB / MONTH**

The data uploaded from the site for Cloud Computing handled by the VIRTUAL PRIVATE SERVER is 4.67 GB per month. The Total Data available on Cloud is now 63 GB since the last 2 years.

The Software has MSSQL, My SQL, Windows Server 16 OS, Python, PHP, Laravel Angular, JSS, Power BI, etc.

The Hardware is 3rd Gen VPS, 8 GB RAM, 240 GB Disk Space, 8 TB / month bandwidth.

Pumping Station Efficiency

An Innovative Approach

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Basic

- ✓ Water / Sewage Pumping Station consists of Multiple Pumps working in parallel, generally 24 hours, to provide un-interrupted flow at varying user requirement.
- ✓ Depending on the user requirement, number of pumps are switched on in a cyclic manner.
- ✓ The Pump are normally SCADA controlled or some Automation system to maintain head/flow.
- ✓ Energy consumed by the Pumping System is generally recorded daily or at hourly intervals.
- ✓ Daily Total Volume of fluid pumped is recorded every day.

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Efficiency

- ✓ Pumps are designed to work at 80-85% efficiency at their Best Efficiency Point (BEP), at a certain Flow and Head. The Pump Curve defines the Efficiency at various Flow / Head combinations.
- ✓ When 2 or more pump start to work in parallel, on a common header, Efficiency gets reduced, and depends on the Pump curves and System curve. Typically the least efficient Pump drags the system efficiency down.
- ✓ Pumping System deficiencies are seen to get reduced to 40-60% range, if parallel operation of Pumps are not correctly done.

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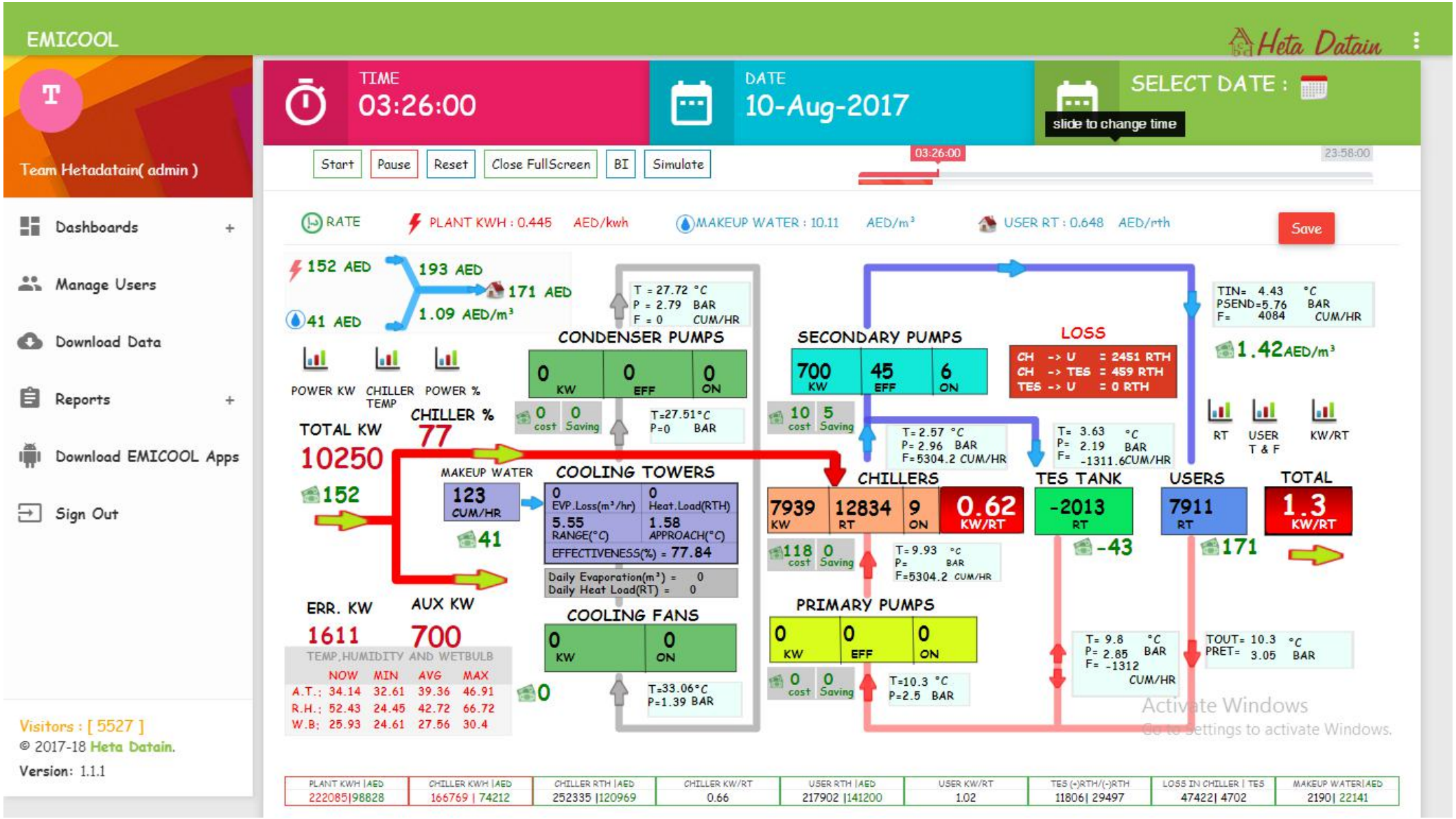
Energy Optimisation Philosophy by HETA DATAIN

- ✓ Problem 1: Calculating individual Pump Efficiency when operating in parallel. Individual Pump flows are not measured. Only cumulative pump flow is measured.
- ✓ Problem 2: Individual Pump Deficiencies vary on the same load with different combinations of Pumps in parallel.
- ✓ Problem 3: If individual Pump Efficiency are not available, then improving Pumping System Efficiency becomes impossible.
- ✓ Solution: Find out the individual Pump Efficiency when operating in parallel, for each combination of parallel operating Pumps. **This will require individual Pump Flow while operating in parallel, which is not measured.**

Case Study of Pump Optimisation

PUMP	
Make	Bell & Gossett
Model	10 x 14 x 20 L
Pump Head	270 FT / 82 M
Flow	5750 UsGpm / 21700 LPM
Pump Type	HSCS
Pump Rpm	1485
Inlet connection	14 Inch
Outlet Connection	10 Inch
Impeller dia	19.3 Inch
MOTOR	
Make	Siemens
Rpm	1489
Amp	657
KW	380
Voltage	400
HZ	50
CosQ	0.87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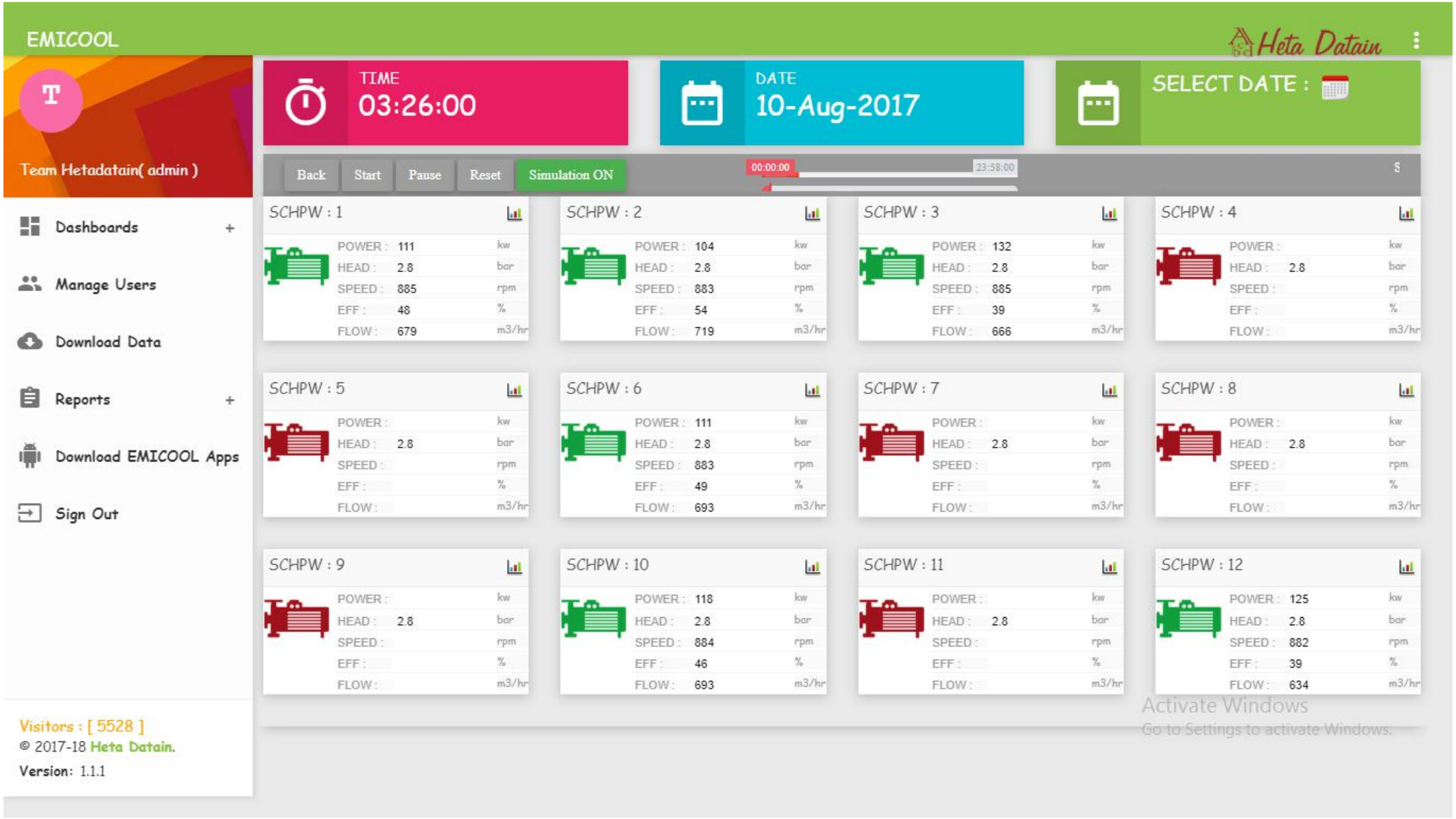
Version: 1.1.1
TIME
03:26:00
DATE
10-Aug-2017
SELECT DATE :
slide to change time
Start
Pause
Reset
Close FullScreen
BI
Simulate
03:26:00
23:58:00
RATE
PLANT KWH : 0.445 AED/kwh
MAKEUP WATER : 10.11 AED/m³
USER RT : 0.648 AED/rth
Save
152 AED
193 AED
171 AED
41 AED
1.09 AED/m³
POWER KW
CHILLER TEMP
POWER %
CONDENSER PUMPS
0 KW
0 EFF
0 ON
0 cost
0 Saving
T=27.51°C
P=0 BAR
T = 27.72 °C
P = 2.79 BAR
F = 0 CUM/HR
SECONDARY PUMPS
700 KW
45 EFF
6 ON
10 cost
5 Saving
T= 2.57 °C
P= 2.96 BAR
F=5304.2 CUM/HR
LOSS
CH -> U = 2451 RTH
CH -> TES = 459 RTH
TES -> U = 0 RTH
T= 3.63 °C
P= 2.19 BAR
F= -1311.6CUM/HR
TIN= 4.43 °C
PSEND=5.76 BAR
F= 4084 CUM/HR
1.42AED/m³
RT
USER T & F
KW/RT
TOTAL KW
10250
152
CHILLER %
77
MAKEUP WATER
123 CUM/HR
41
COOLING TOWERS
0 EVP.Loss(m³/hr)
0 Heat.Load(RTH)
5.55 RANGE(°C)
1.58 APPROACH(°C)
EFFECTIVENESS(%) = 77.84
Daily Evaporation(m³) = 0
Daily Heat Load(RT) = 0
CHILLERS
7939 KW
12834 RT
9 ON
0.62 KW/RT
118 cost
0 Saving
T= 9.93 °C
P= BAR
F=5304.2 CUM/HR
TES TANK
-2013 RT
-43
USERS
7911 RT
171
TOTAL
1.3 KW/RT
ERR. KW
1611
AUX KW
700
COOLING FANS
0 KW
0 ON
0
T=33.06°C
P=1.39 BAR
PRIMARY PUMPS
0 KW
0 EFF
0 ON
0 cost
0 Saving
T=10.3 °C
P=2.5 BAR
T= 9.8 °C
P= 2.85 BAR
F= -1312 CUM/HR
TOUT= 10.3 °C
PRET= 3.05 BAR
TEMP,HUMIDITY AND WETBULB
NOW MIN AVG MAX
A.T.; 34.14 32.61 39.36 46.91
R.H.; 52.43 24.45 42.72 66.72
W.B; 25.93 24.61 27.56 30.4
Activate Windows
Go to Settings to activate Windows.
PLANT KWH |AED
222085|98828
CHILLER KWH |AED
166769 | 74212
CHILLER RTH |AED
252335 |120969
CHILLER KW/RT
0.66
USER RTH |AED
217902 |141200
USER KW/RT
1.02
TES (+)RTH/(-)RTH
11806| 29497
LOSS IN CHILLER | TES
47422| 4702
MAKEUP WATER|AED
2190| 22141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TIME
03:26:00
DATE
10-Aug-2017
SELECT DATE :
Back
Start
Pause
Reset
Simulation ON
00:00:00
23:58:00
SCHPW : 1
POWER : 111 kw
HEAD : 2.8 bar
SPEED : 885 rpm
EFF : 48 %
FLOW : 679 m3/hr
SCHPW : 2
POWER : 104 kw
HEAD : 2.8 bar
SPEED : 883 rpm
EFF : 54 %
FLOW : 719 m3/hr
SCHPW : 3
POWER : 132 kw
HEAD : 2.8 bar
SPEED : 885 rpm
EFF : 39 %
FLOW : 666 m3/hr
SCHPW : 4
POWER : kw
HEAD : 2.8 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 5
POWER : kw
HEAD : 2.8 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 6
POWER : 111 kw
HEAD : 2.8 bar
SPEED : 883 rpm
EFF : 49 %
FLOW : 693 m3/hr
SCHPW : 7
POWER : kw
HEAD : 2.8 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 8
POWER : kw
HEAD : 2.8 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 9
POWER : kw
HEAD : 2.8 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 10
POWER : 118 kw
HEAD : 2.8 bar
SPEED : 884 rpm
EFF : 46 %
FLOW : 693 m3/hr
SCHPW : 11
POWER : kw
HEAD : 2.8 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 12
POWER : 125 kw
HEAD : 2.8 bar
SPEED : 882 rpm
EFF : 39 %
FLOW : 634 m3/hr
Visitors : [5528]
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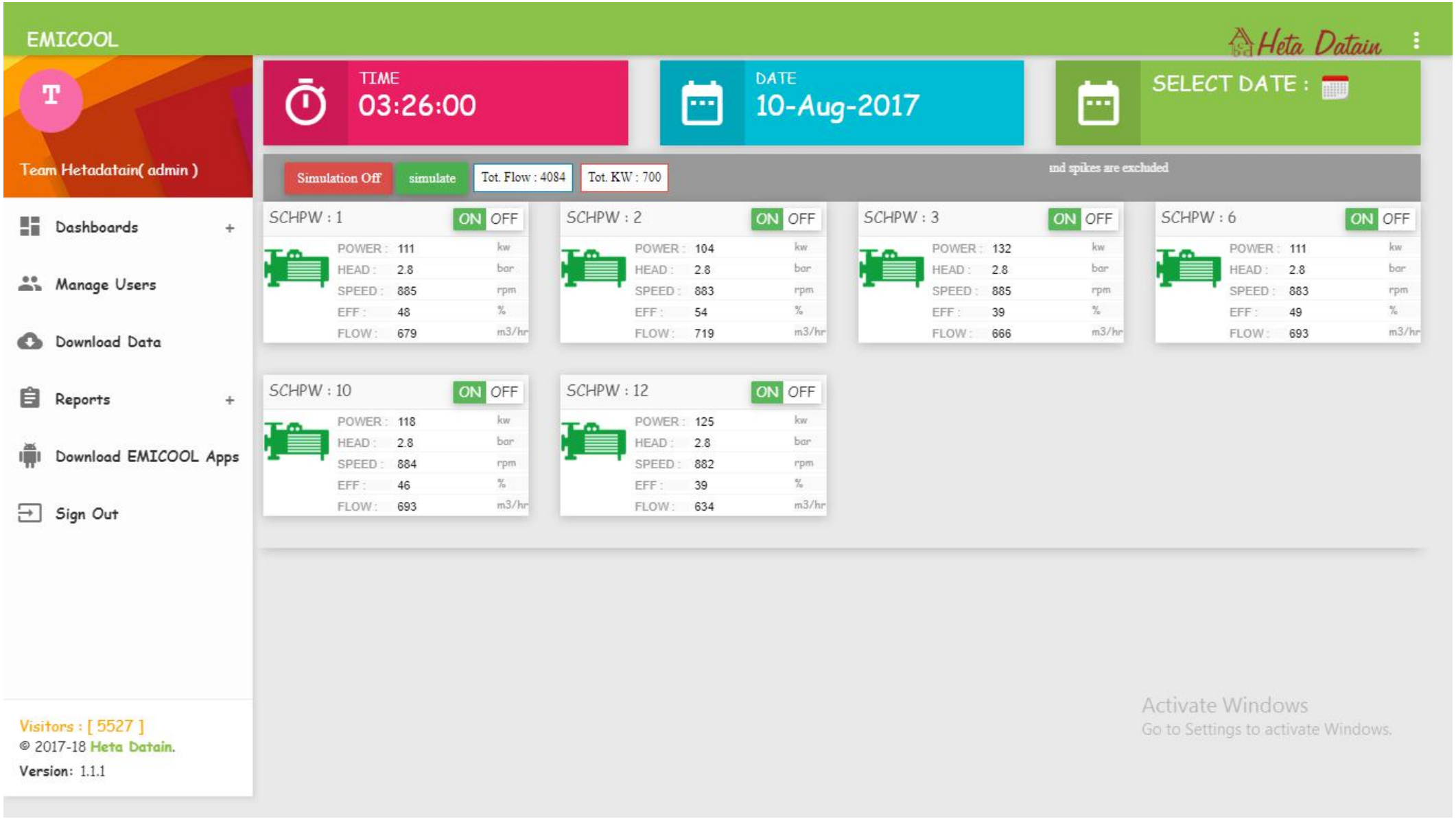
Version: 1.1.1
Activate Windows
Go to Settings to activate Windows.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TIME
03:26:00
DATE
10-Aug-2017
SELECT DATE :
Simulation Off
simulate
Tot. Flow : 4084
Tot. KW : 700
nd spikes are excluded
SCHPW : 1
ON OFF
POWER : 111 kw
HEAD : 2.8 bar
SPEED : 885 rpm
EFF : 48 %
FLOW : 679 m3/hr
SCHPW : 2
ON OFF
POWER : 104 kw
HEAD : 2.8 bar
SPEED : 883 rpm
EFF : 54 %
FLOW : 719 m3/hr
SCHPW : 3
ON OFF
POWER : 132 kw
HEAD : 2.8 bar
SPEED : 885 rpm
EFF : 39 %
FLOW : 666 m3/hr
SCHPW : 6
ON OFF
POWER : 111 kw
HEAD : 2.8 bar
SPEED : 883 rpm
EFF : 49 %
FLOW : 693 m3/hr
SCHPW : 10
ON OFF
POWER : 118 kw
HEAD : 2.8 bar
SPEED : 884 rpm
EFF : 46 %
FLOW : 693 m3/hr
SCHPW : 12
ON OFF
POWER : 125 kw
HEAD : 2.8 bar
SPEED : 882 rpm
EFF : 39 %
FLOW : 634 m3/hr
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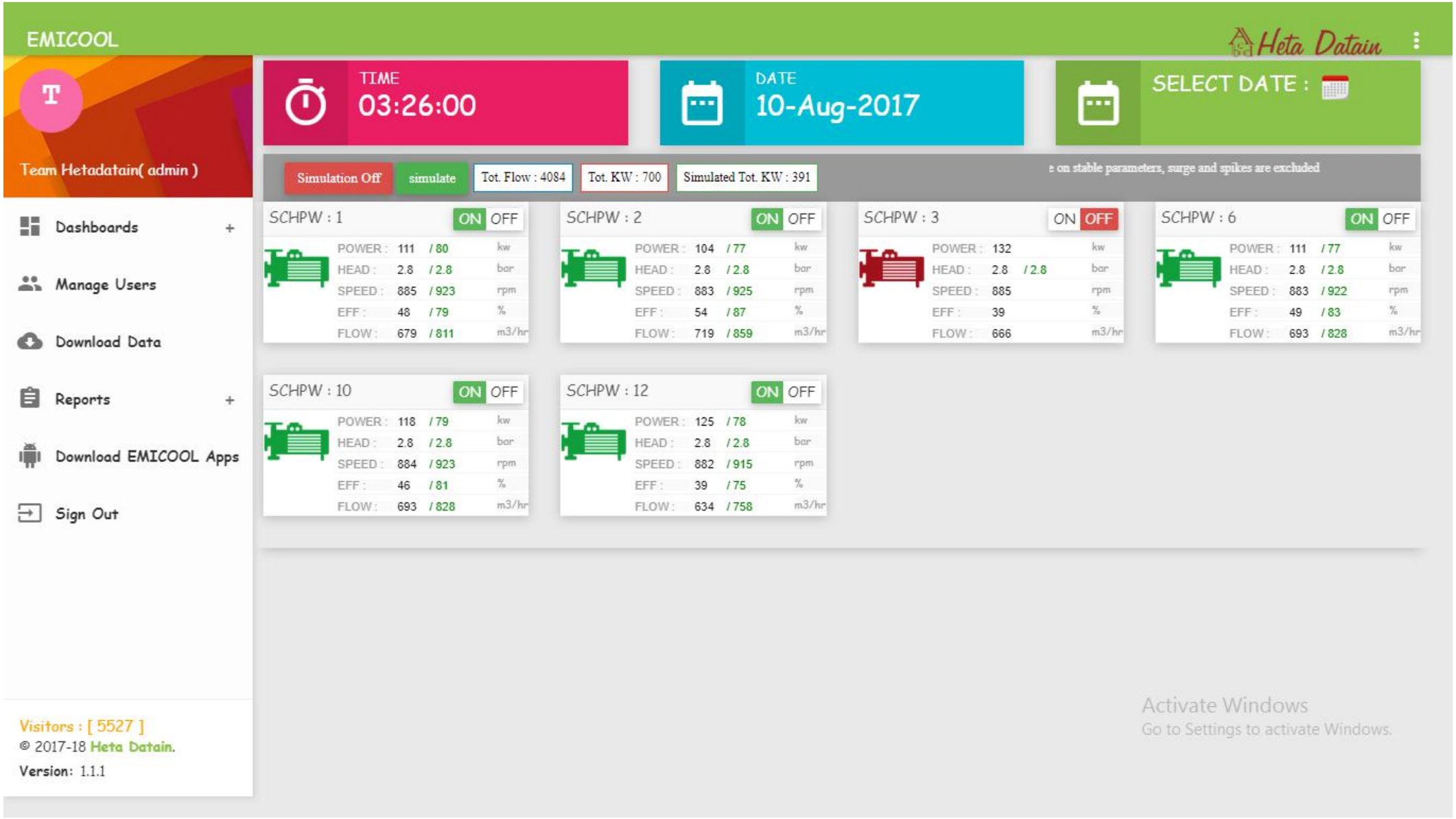
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Sign Out
TIME
03:26:00
DATE
10-Aug-2017
SELECT DATE :
Simulation Off
simulate
Tot. Flow : 4084
Tot. KW : 700
Simulated Tot. KW : 391
e on stable parameters, surge and spikes are excluded
SCHPW : 1
ON OFF
POWER : 111 / 80 kw
HEAD : 2.8 / 2.8 bar
SPEED : 885 / 923 rpm
EFF : 48 / 79 %
FLOW : 679 / 811 m3/hr
SCHPW : 2
ON OFF
POWER : 104 / 77 kw
HEAD : 2.8 / 2.8 bar
SPEED : 883 / 925 rpm
EFF : 54 / 87 %
FLOW : 719 / 859 m3/hr
SCHPW : 3
ON OFF
POWER : 132 kw
HEAD : 2.8 / 2.8 bar
SPEED : 885 rpm
EFF : 39 %
FLOW : 666 m3/hr
SCHPW : 6
ON OFF
POWER : 111 / 77 kw
HEAD : 2.8 / 2.8 bar
SPEED : 883 / 922 rpm
EFF : 49 / 83 %
FLOW : 693 / 828 m3/hr
SCHPW : 10
ON OFF
POWER : 118 / 79 kw
HEAD : 2.8 / 2.8 bar
SPEED : 884 / 923 rpm
EFF : 46 / 81 %
FLOW : 693 / 828 m3/hr
SCHPW : 12
ON OFF
POWER : 125 / 78 kw
HEAD : 2.8 / 2.8 bar
SPEED : 882 / 915 rpm
EFF : 39 / 75 %
FLOW : 634 / 758 m3/hr
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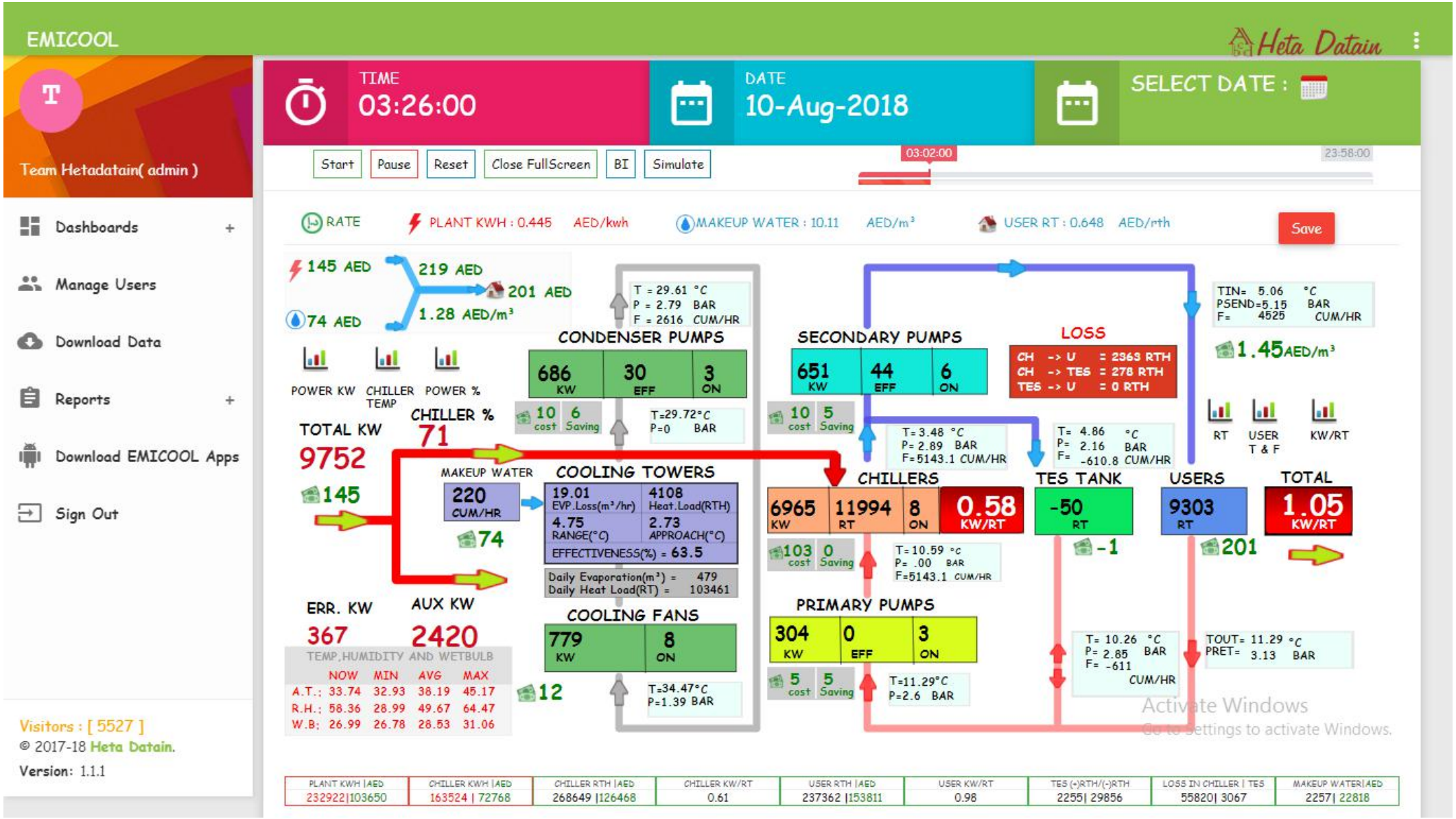
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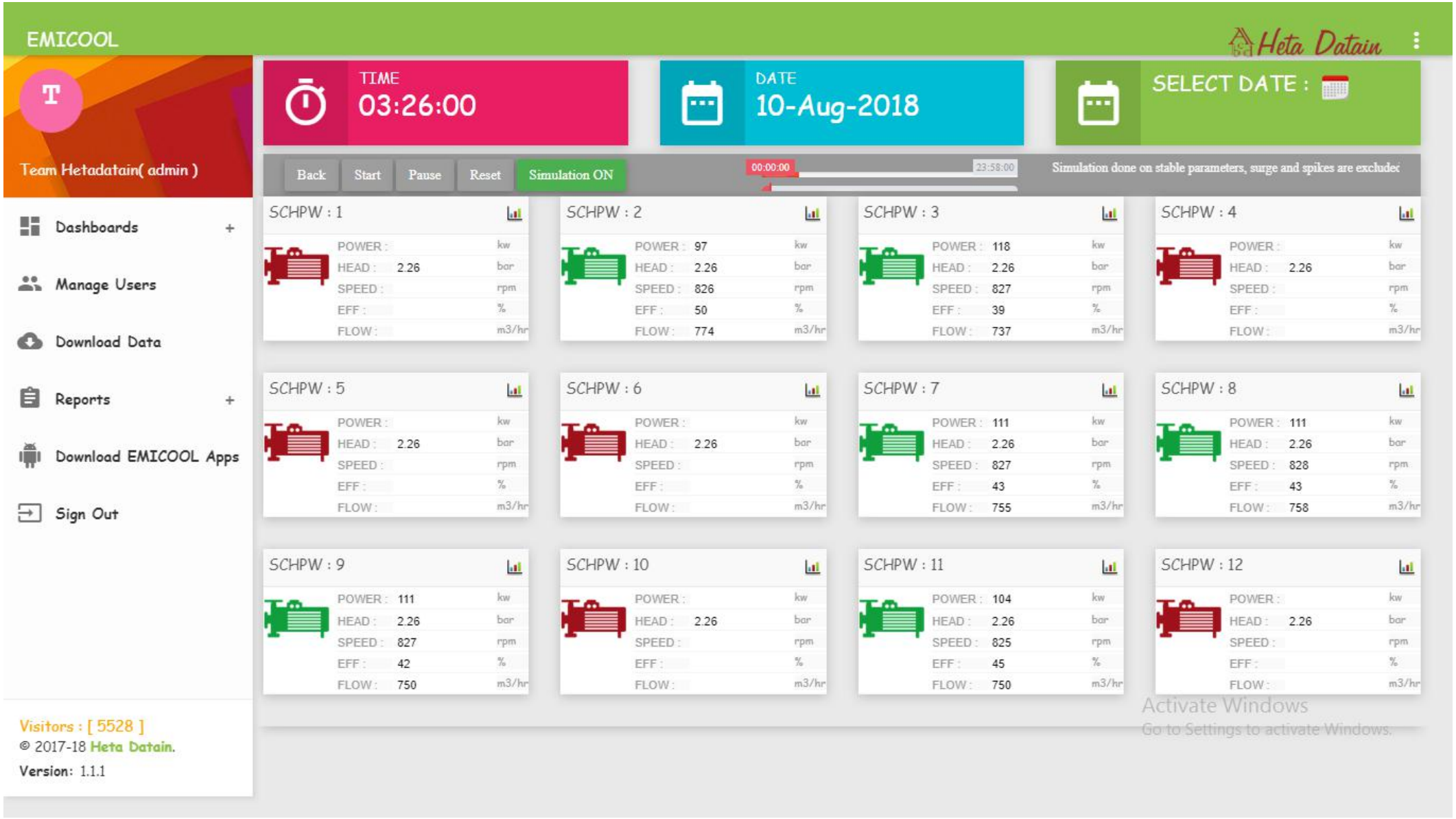
TIME
03:26:00
DATE
10-Aug-2018
SELECT DATE :
Start
Pause
Reset
Close FullScreen
BI
Simulate
03:02:00
23:58:00
RATE
PLANT KWH : 0.445 AED/kwh
MAKEUP WATER : 10.11 AED/m³
USER RT : 0.648 AED/rth
Save
145 AED
219 AED
201 AED
74 AED
1.28 AED/m³
POWER KW
CHILLER TEMP
POWER %
CONDENSER PUMPS
686 KW
30 EFF
3 ON
10 cost
6 Saving
T=29.72°C
P=0 BAR
T = 29.61 °C
P = 2.79 BAR
F = 2616 CUM/HR
SECONDARY PUMPS
651 KW
44 EFF
6 ON
10 cost
5 Saving
T= 3.48 °C
P= 2.89 BAR
F=5143.1 CUM/HR
LOSS
CH -> U = 2363 RTH
CH -> TES = 278 RTH
TES -> U = 0 RTH
T= 4.86 °C
P= 2.16 BAR
F= -610.8 CUM/HR
TIN= 5.06 °C
PSEND=5.15 BAR
F= 4525 CUM/HR
1.45 AED/m³
RT
USER T & F
KW/RT
TOTAL KW
9752
145
CHILLER %
71
MAKEUP WATER
220 CUM/HR
74
COOLING TOWERS
19.01 EVP.Loss(m³/hr)
4108 Heat.Load(RTH)
4.75 RANGE(°C)
2.73 APPROACH(°C)
EFFECTIVENESS(%) = 63.5
Daily Evaporation(m³) = 479
Daily Heat Load(RT) = 103461
CHILLERS
6965 KW
11994 RT
8 ON
0.58 KW/RT
103 cost
0 Saving
T= 10.59 °C
P= .00 BAR
F=5143.1 CUM/HR
TES TANK
-50 RT
-1
USERS
9303 RT
201
TOTAL
1.05 KW/RT
ERR. KW
367
AUX KW
2420
COOLING FANS
779 KW
8 ON
12
T=34.47°C
P=1.39 BAR
PRIMARY PUMPS
304 KW
0 EFF
3 ON
5 cost
5 Saving
T=11.29°C
P=2.6 BAR
T= 10.26 °C
P= 2.85 BAR
F= -611 CUM/HR
TOUT= 11.29 °C
PRET= 3.13 BAR
TEMP,HUMIDITY AND WETBULB
NOW MIN AVG MAX
A.T.; 33.74 32.93 38.19 45.17
R.H.; 58.36 28.99 49.67 64.47
W.B; 26.99 26.78 28.53 31.06
Activate Windows
Go to Settings to activate Windows.
PLANT KWH |AED
232922|103650
CHILLER KWH |AED
163524 | 72768
CHILLER RTH |AED
268649 |126468
CHILLER KW/RT
0.61
USER RTH |AED
237362 |153811
USER KW/RT
0.98
TES (+)RTH/(-)RTH
2255| 29856
LOSS IN CHILLER | TES
55820| 3067
MAKEUP WATER|AED
2257| 22818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TIME
03:26:00
DATE
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SELECT DATE :
Back
Start
Pause
Reset
Simulation ON
00:00:00
23:58:00
Simulation done on stable parameters, surge and spikes are excluded
SCHPW : 1
POWER : kw
HEAD : 2.26 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 2
POWER : 97 kw
HEAD : 2.26 bar
SPEED : 826 rpm
EFF : 50 %
FLOW : 774 m3/hr
SCHPW : 3
POWER : 118 kw
HEAD : 2.26 bar
SPEED : 827 rpm
EFF : 39 %
FLOW : 737 m3/hr
SCHPW : 4
POWER : kw
HEAD : 2.26 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 5
POWER : kw
HEAD : 2.26 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 6
POWER : kw
HEAD : 2.26 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 7
POWER : 111 kw
HEAD : 2.26 bar
SPEED : 827 rpm
EFF : 43 %
FLOW : 755 m3/hr
SCHPW : 8
POWER : 111 kw
HEAD : 2.26 bar
SPEED : 828 rpm
EFF : 43 %
FLOW : 758 m3/hr
SCHPW : 9
POWER : 111 kw
HEAD : 2.26 bar
SPEED : 827 rpm
EFF : 42 %
FLOW : 750 m3/hr
SCHPW : 10
POWER : kw
HEAD : 2.26 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 11
POWER : 104 kw
HEAD : 2.26 bar
SPEED : 825 rpm
EFF : 45 %
FLOW : 750 m3/hr
SCHPW : 12
POWER : kw
HEAD : 2.26 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
Visitors : [5528]
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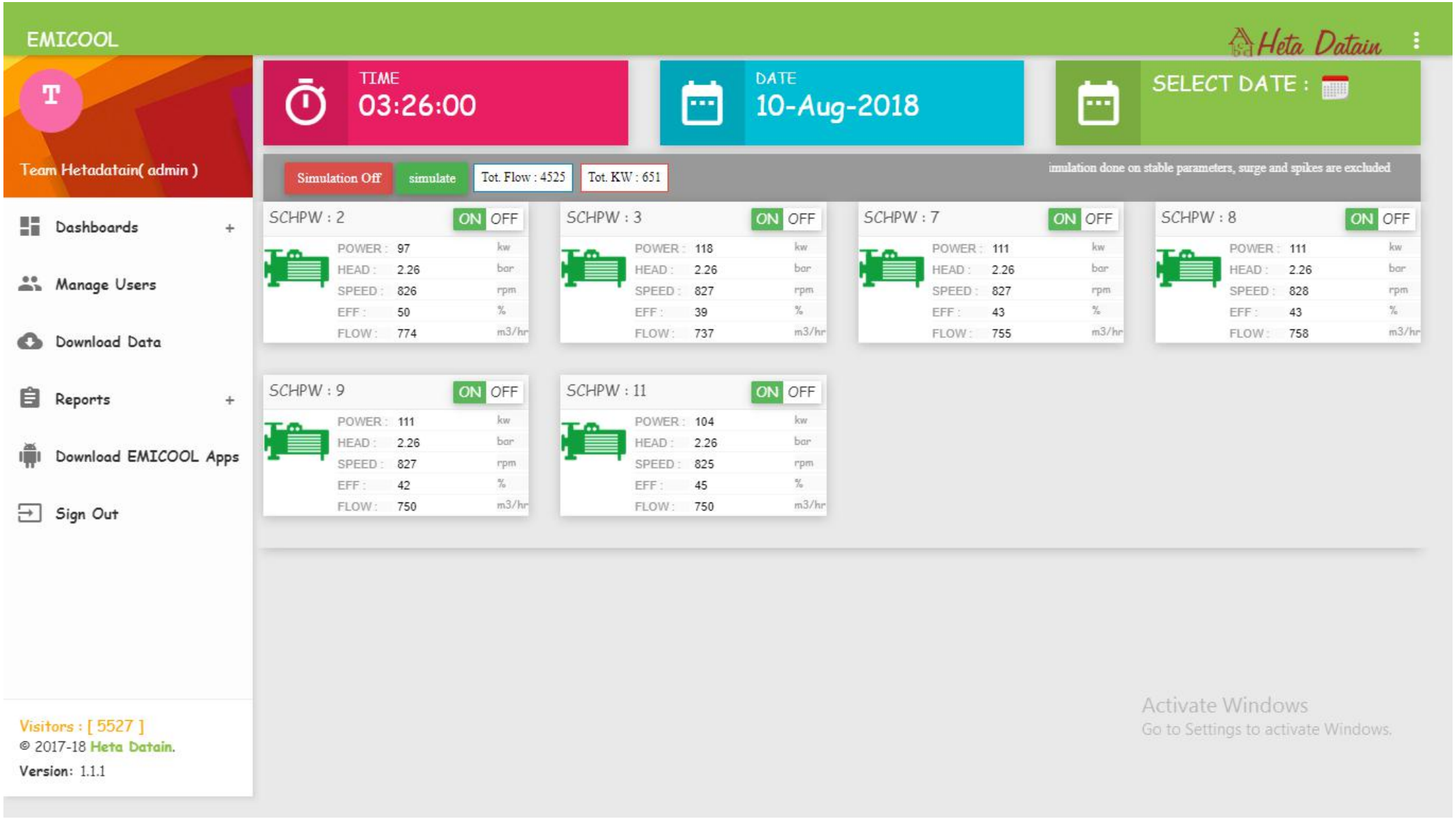
Activate Windows
Go to Settings to activate Windows.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TIME
03:26:00
DATE
10-Aug-2018
SELECT DATE :
Simulation Off
simulate
Tot. Flow : 4525
Tot. KW : 651
imulation done on stable parameters, surge and spikes are excluded
SCHPW : 2 ON OFF
POWER : 97 kw
HEAD : 2.26 bar
SPEED : 826 rpm
EFF : 50 %
FLOW : 774 m3/hr
SCHPW : 3 ON OFF
POWER : 118 kw
HEAD : 2.26 bar
SPEED : 827 rpm
EFF : 39 %
FLOW : 737 m3/hr
SCHPW : 7 ON OFF
POWER : 111 kw
HEAD : 2.26 bar
SPEED : 827 rpm
EFF : 43 %
FLOW : 755 m3/hr
SCHPW : 8 ON OFF
POWER : 111 kw
HEAD : 2.26 bar
SPEED : 828 rpm
EFF : 43 %
FLOW : 758 m3/hr
SCHPW : 9 ON OFF
POWER : 111 kw
HEAD : 2.26 bar
SPEED : 827 rpm
EFF : 42 %
FLOW : 750 m3/hr
SCHPW : 11 ON OFF
POWER : 104 kw
HEAD : 2.26 bar
SPEED : 825 rpm
EFF : 45 %
FLOW : 750 m3/hr
Visitors : [5527]
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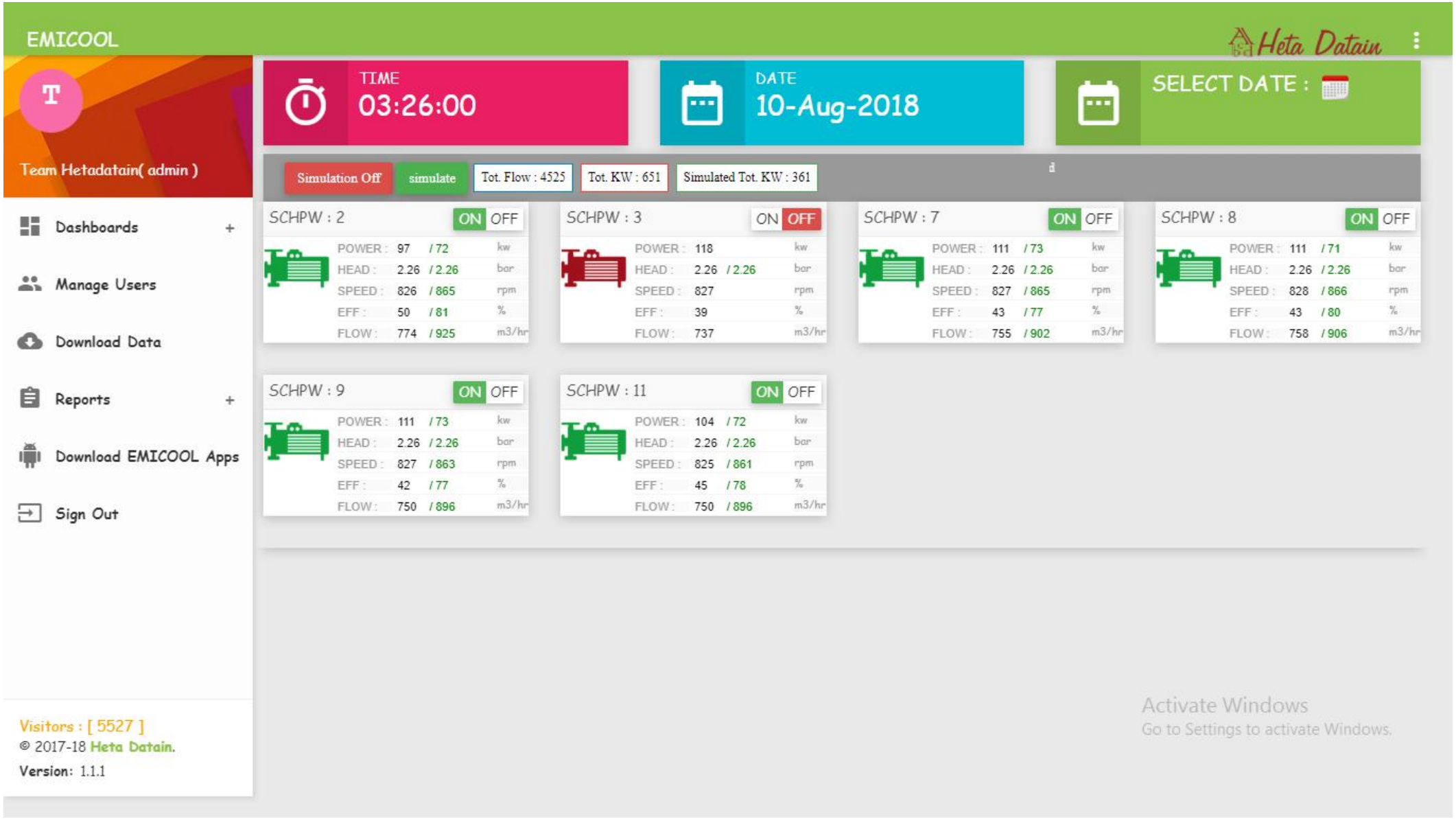
Activate Windows
Go to Settings to activate Windows.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TIME
03:26:00
DATE
10-Aug-2018
SELECT DATE :
Simulation Off
simulate
Tot. Flow : 4525
Tot. KW : 651
Simulated Tot. KW : 361
SCHPW : 2 ON OFF
POWER : 97 / 72 kw
HEAD : 2.26 / 2.26 bar
SPEED : 826 / 865 rpm
EFF : 50 / 81 %
FLOW : 774 / 925 m3/hr
SCHPW : 3 ON OFF
POWER : 118 kw
HEAD : 2.26 / 2.26 bar
SPEED : 827 rpm
EFF : 39 %
FLOW : 737 m3/hr
SCHPW : 7 ON OFF
POWER : 111 / 73 kw
HEAD : 2.26 / 2.26 bar
SPEED : 827 / 865 rpm
EFF : 43 / 77 %
FLOW : 755 / 902 m3/hr
SCHPW : 8 ON OFF
POWER : 111 / 71 kw
HEAD : 2.26 / 2.26 bar
SPEED : 828 / 866 rpm
EFF : 43 / 80 %
FLOW : 758 / 906 m3/hr
SCHPW : 9 ON OFF
POWER : 111 / 73 kw
HEAD : 2.26 / 2.26 bar
SPEED : 827 / 863 rpm
EFF : 42 / 77 %
FLOW : 750 / 896 m3/hr
SCHPW : 11 ON OFF
POWER : 104 / 72 kw
HEAD : 2.26 / 2.26 bar
SPEED : 825 / 861 rpm
EFF : 45 / 78 %
FLOW : 750 / 896 m3/hr
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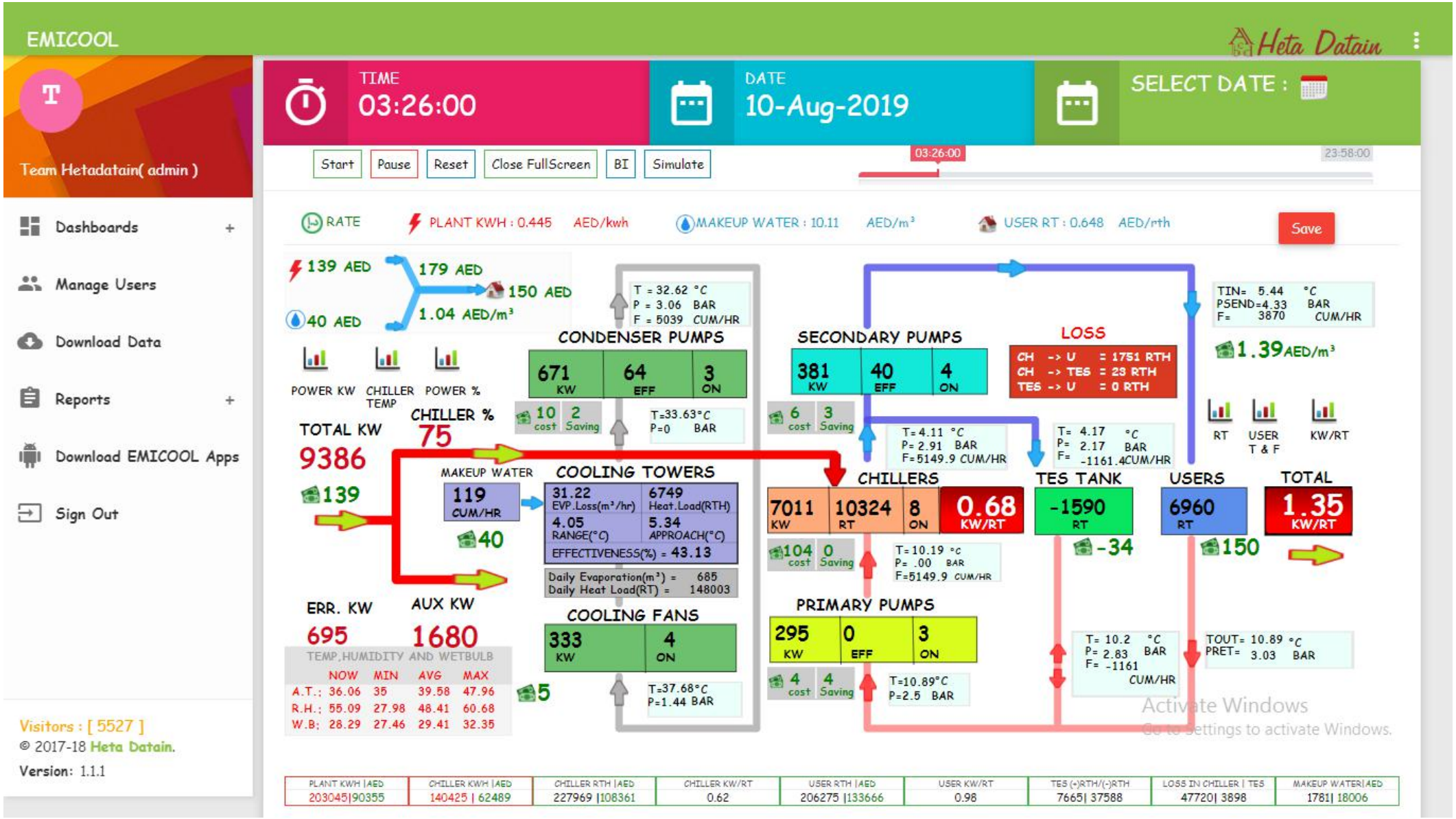
Activate Windows
Go to Settings to activate Windows.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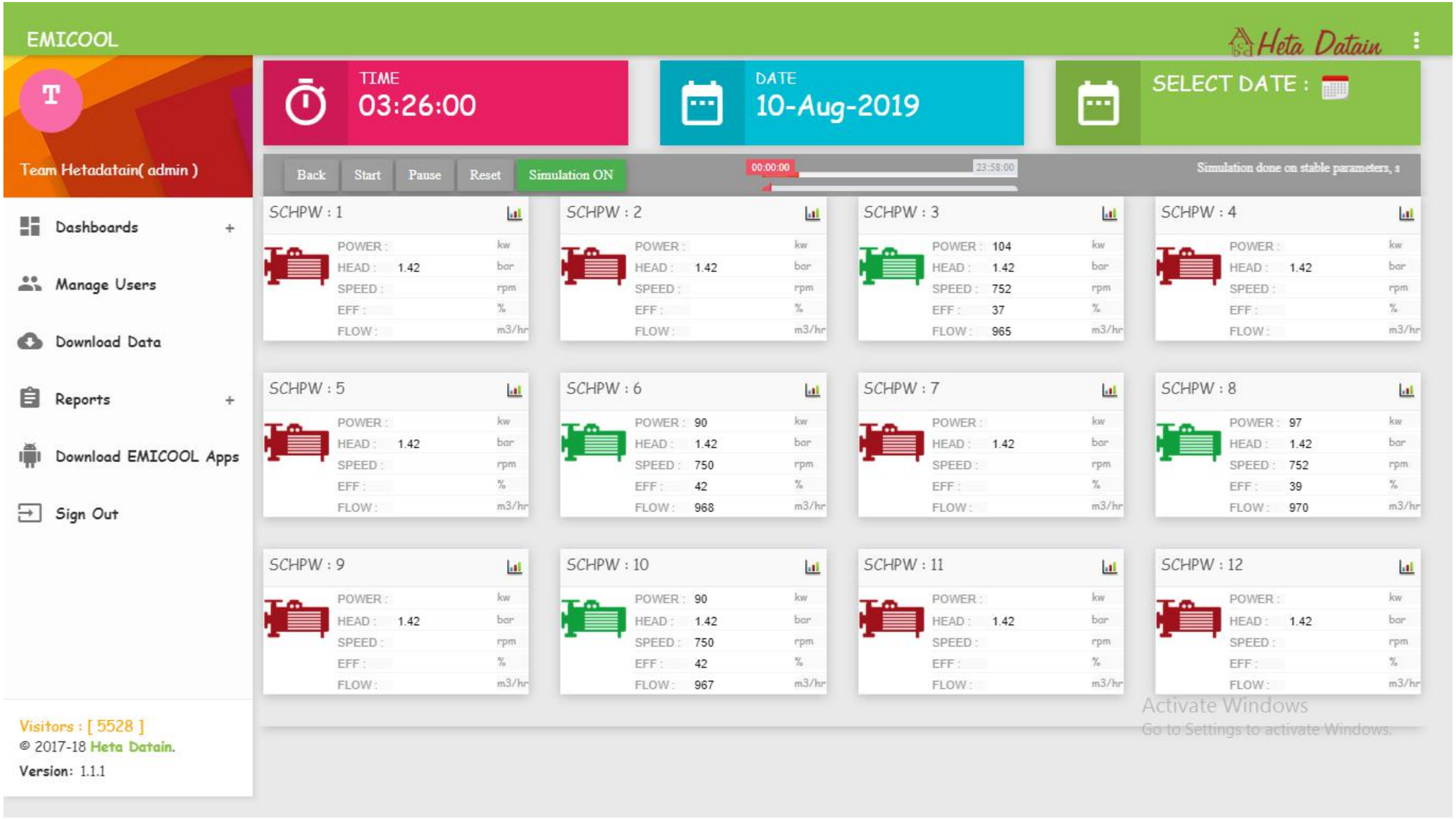
Version: 1.1.1
TIME
03:26:00
DATE
10-Aug-2019
SELECT DATE :
Start
Pause
Reset
Close FullScreen
BI
Simulate
03:26:00
23:58:00
RATE
PLANT KWH : 0.445 AED/kwh
MAKEUP WATER : 10.11 AED/m³
USER RT : 0.648 AED/rth
Save
139 AED
179 AED
150 AED
40 AED
1.04 AED/m³
POWER KW
CHILLER TEMP
POWER %
CONDENSER PUMPS
671 KW
64 EFF
3 ON
10 cost
2 Saving
T=33.63°C
P=0 BAR
T = 32.62 °C
P = 3.06 BAR
F = 5039 CUM/HR
SECONDARY PUMPS
381 KW
40 EFF
4 ON
6 cost
3 Saving
T= 4.11 °C
P= 2.91 BAR
F=5149.9 CUM/HR
LOSS
CH -> U = 1751 RTH
CH -> TES = 23 RTH
TES -> U = 0 RTH
T= 4.17 °C
P= 2.17 BAR
F= -1161.4CUM/HR
TIN= 5.44 °C
PSEND=4.33 BAR
F= 3870 CUM/HR
1.39AED/m³
RT
USER T & F
KW/RT
TOTAL KW
9386
139
CHILLER %
75
MAKEUP WATER
119 CUM/HR
40
COOLING TOWERS
31.22 EVP.Loss(m³/hr)
6749 Heat.Load(RTH)
4.05 RANGE(°C)
5.34 APPROACH(°C)
EFFECTIVENESS(%) = 43.13
Daily Evaporation(m³) = 685
Daily Heat Load(RT) = 148003
CHILLERS
7011 KW
10324 RT
8 ON
0.68 KW/RT
104 cost
0 Saving
T= 10.19 °C
P= .00 BAR
F=5149.9 CUM/HR
TES TANK
-1590 RT
-34
USERS
6960 RT
150
TOTAL
1.35 KW/RT
ERR. KW
695
AUX KW
1680
COOLING FANS
333 KW
4 ON
5
T=37.68°C
P=1.44 BAR
PRIMARY PUMPS
295 KW
0 EFF
3 ON
4 cost
4 Saving
T=10.89°C
P=2.5 BAR
T= 10.2 °C
P= 2.83 BAR
F= -1161 CUM/HR
TOUT= 10.89 °C
PRET= 3.03 BAR
TEMP,HUMIDITY AND WETBULB
NOW MIN AVG MAX
A.T.; 36.06 35 39.58 47.96
R.H.; 55.09 27.98 48.41 60.68
W.B; 28.29 27.46 29.41 32.35
Activate Windows
Go to Settings to activate Windows.
PLANT KWH |AED
203045|90355
CHILLER KWH |AED
140425 | 62489
CHILLER RTH |AED
227969 |108361
CHILLER KW/RT
0.62
USER RTH |AED
206275 |133666
USER KW/RT
0.98
TES (+)RTH/(-)RTH
7665| 37588
LOSS IN CHILLER | TES
47720| 3898
MAKEUP WATER|AED
1781| 18006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TIME
03:26:00
DATE
10-Aug-2019
SELECT DATE :
Back
Start
Pause
Reset
Simulation ON
00:00:00
23:58:00
Simulation done on stable parameters, s
SCHPW : 1
POWER : kw
HEAD : 1.42 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 2
POWER : kw
HEAD : 1.42 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 3
POWER : 104 kw
HEAD : 1.42 bar
SPEED : 752 rpm
EFF : 37 %
FLOW : 965 m3/hr
SCHPW : 4
POWER : kw
HEAD : 1.42 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 5
POWER : kw
HEAD : 1.42 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 6
POWER : 90 kw
HEAD : 1.42 bar
SPEED : 750 rpm
EFF : 42 %
FLOW : 968 m3/hr
SCHPW : 7
POWER : kw
HEAD : 1.42 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 8
POWER : 97 kw
HEAD : 1.42 bar
SPEED : 752 rpm
EFF : 39 %
FLOW : 970 m3/hr
SCHPW : 9
POWER : kw
HEAD : 1.42 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 10
POWER : 90 kw
HEAD : 1.42 bar
SPEED : 750 rpm
EFF : 42 %
FLOW : 967 m3/hr
SCHPW : 11
POWER : kw
HEAD : 1.42 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
SCHPW : 12
POWER : kw
HEAD : 1.42 bar
SPEED : rpm
EFF : %
FLOW : m3/hr
Visitors : [5528]
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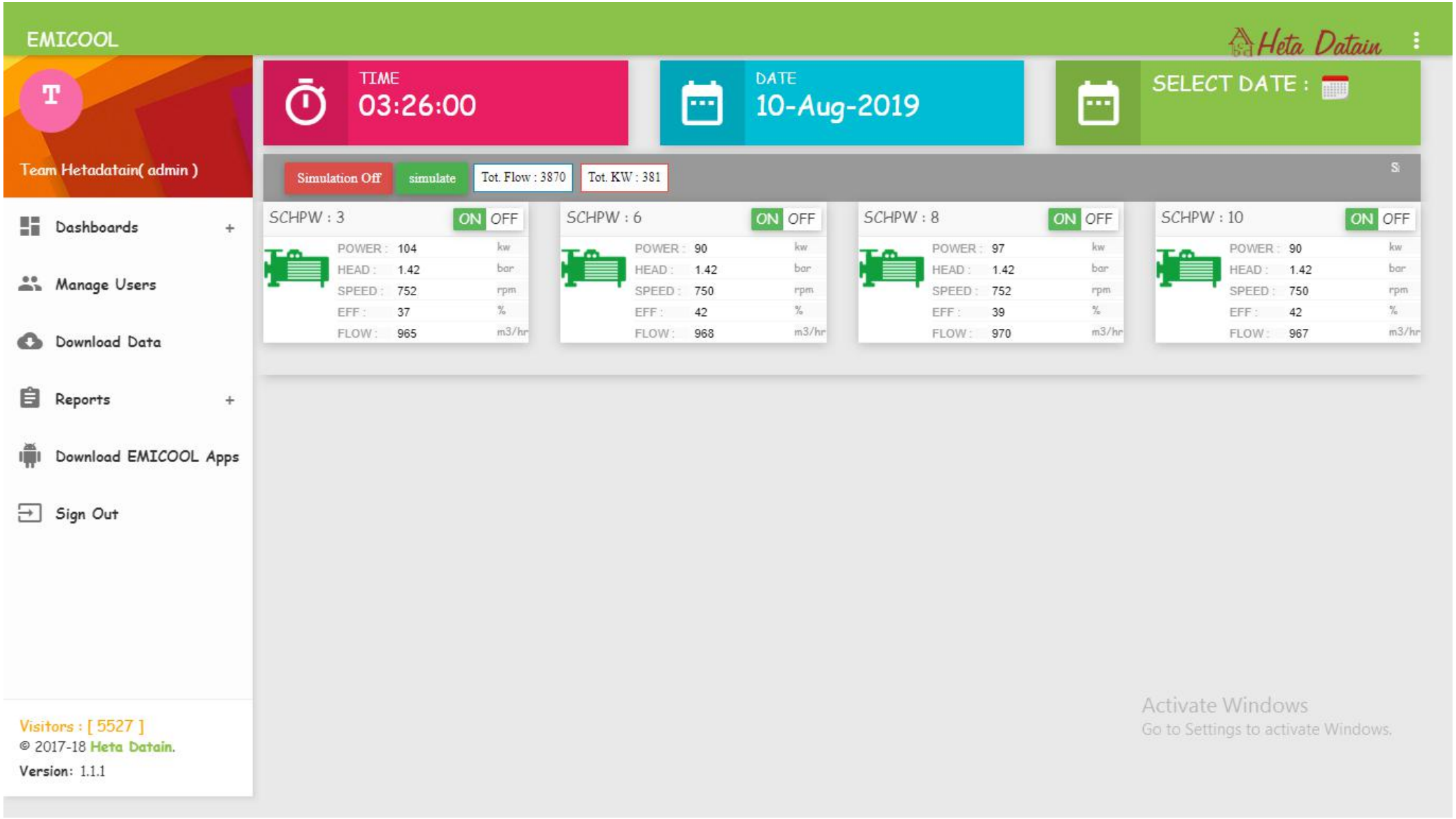
Version: 1.1.1
Activate Windows
Go to Settings to activate Windows.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TIME
03:26:00
DATE
10-Aug-2019
SELECT DATE :
Simulation Off
simulate
Tot. Flow : 3870
Tot. KW : 381
SCHPW : 3
ON OFF
POWER : 104 kw
HEAD : 1.42 bar
SPEED : 752 rpm
EFF : 37 %
FLOW : 965 m3/hr
SCHPW : 6
ON OFF
POWER : 90 kw
HEAD : 1.42 bar
SPEED : 750 rpm
EFF : 42 %
FLOW : 968 m3/hr
SCHPW : 8
ON OFF
POWER : 97 kw
HEAD : 1.42 bar
SPEED : 752 rpm
EFF : 39 %
FLOW : 970 m3/hr
SCHPW : 10
ON OFF
POWER : 90 kw
HEAD : 1.42 bar
SPEED : 750 rpm
EFF : 42 %
FLOW : 967 m3/hr
Visitors : [5527]
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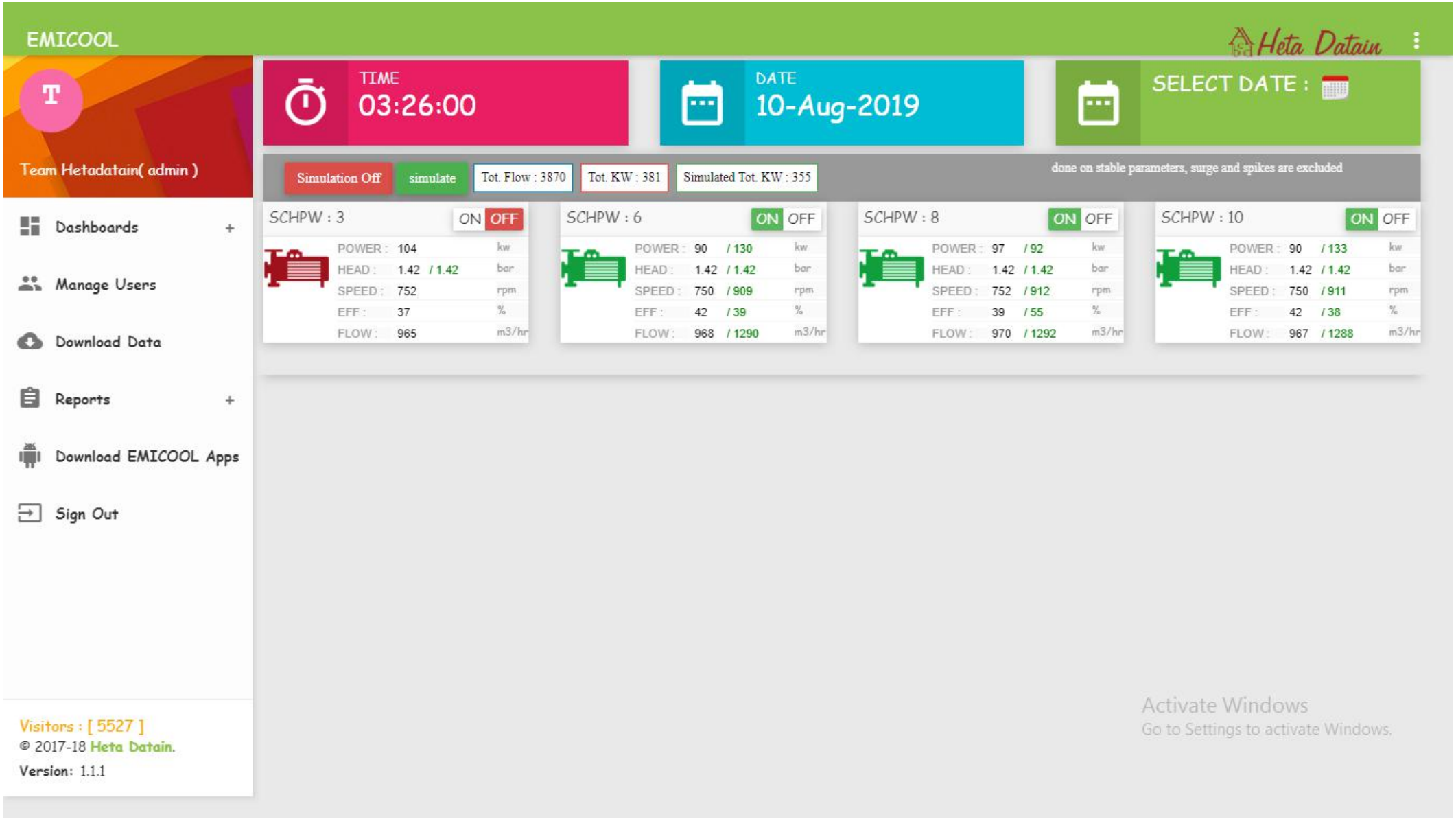
Version: 1.1.1
Activate Windows
Go to Settings to activate Windows.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TIME
03:26:00
DATE
10-Aug-2019
SELECT DATE :
Simulation Off
simulate
Tot. Flow : 3870
Tot. KW : 381
Simulated Tot. KW : 355
done on stable parameters, surge and spikes are excluded
SCHPW : 3
ON OFF
POWER : 104 kw
HEAD : 1.42 / 1.42 bar
SPEED : 752 rpm
EFF : 37 %
FLOW : 965 m3/hr
SCHPW : 6
ON OFF
POWER : 90 / 130 kw
HEAD : 1.42 / 1.42 bar
SPEED : 750 / 909 rpm
EFF : 42 / 39 %
FLOW : 968 / 1290 m3/hr
SCHPW : 8
ON OFF
POWER : 97 / 92 kw
HEAD : 1.42 / 1.42 bar
SPEED : 752 / 912 rpm
EFF : 39 / 55 %
FLOW : 970 / 1292 m3/hr
SCHPW : 10
ON OFF
POWER : 90 / 133 kw
HEAD : 1.42 / 1.42 bar
SPEED : 750 / 911 rpm
EFF : 42 / 38 %
FLOW : 967 / 1288 m3/hr
Visitors : [5527]
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Activate Windows
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Date	Time	Head	Total Flow Required	Total Pumps ON		Actual Speed	Simulated Speed	Operating Power	Simulated Power	Savings per year (4320 hrs)
		(Bar)	(m3/hr)	Before Simulation	After Simulation	(RPM)	(RPM)	(KW)	(KW)	@ Rs.5 per KWHr
10-Aug-17	03:26	2.8	4084	6	5	885	923	700	392	Rs 66 Lac
10-Aug-18		2.26	4525	6	5	826	865	651	367	Rs. 46 Lac
10-Aug-19		1.42	3870	4	3	752	910	381	355	Rs 5 Lac

Process changes done

1. Reduction in HEAD by changing the USER side Flow Control

2. Changes in Pump parameters to get the Operating Point towards the Best Efficiency Point

Result of Pump Energy Optimisation

Heta Datain

Each Pump Specification
12 Pumps in parallel

Head	8 BAR
Flow	1305 CUM/HR
Motor	450 KW
Speed	1485 RPM

Normal Mode Scenario

6 Pumps work to give 5843 CUM/HR at 5.05 BAR consuming 1856 KW.
Cost of Pumping is Rs. 1.58 / CUM

Energy Optimized Mode

5 Pumps work to give 5843 CUM/HR at 5.05 BAR consuming 1044 KW
Cost of Pumping is Rs. 0.89 / CUM

Savings: 43%

Savings / year (working 4320 hrs)
= Rs 1.75 Crore

Heta Datain

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