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INCREASING PRODUCTIVITY THROUGH AUTOMATION

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In today's Global Scenario manufacturing Efficiency and Agility is not an option , but it is a strategic requirement

Metrics, including
RETURN ON NET ASSETS
(RONA),
are increasingly scrutinized.

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In today's scenario production cost is increasing rapidly. The labour cost, raw material cost, power cost, etc. are not in our control. Hence to increase the productivity and reduce the production cost we can only have controls on:

- Manpower cost – by reducing manpower
- Utility cost – by power saving
- Quality improvement – Through good control
- High production – Through state of art machine
- Keeping proper record – Through systems

All these can be possible only by implementing

Automation

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What is Automation?

Monitoring and controlling of any process with the help of latest technologies like software, ladder and logic controls, Robotics, ERP system and incorporating central computer is called Automation.

WHY AUTOMATION

- Achieve more with less.
- Elimination of human error
- Cleaner Technology
- Consistency of product
- Minimize Energy consumption
- Easy diagnosis of fault

WHY AUTOMATION

- Reduction in Resources (Chemicals ,water , energy etc.)
- Reduce manpower.
- Data collection and consolidation.
- Effective application for Complex tasks
- Trending and Report generation.

WHY AUTOMATION

- Reduction of Peak Loads
- Reduction in Effluent
- Environment Protection.
- Improve Safety and Health.
- Reduce Maintenance.

EFFECT ON PRODUCTIVITY

Automation effects the productivity in following aspects

a) Increasing production by avoiding manual delays.

b) Improving productivity by achieving the optimum efficiency of the machine.

c) Avoiding reprocessing and improving the productivity.

EFFECT ON PRODUCTIVITY

d) Automation improves the power saving possibilities and hence the cost of product goes down.

e) By avoiding manual error it improves the quality of product and hence productivity.

f) Automation can give useful data of the machines which increases the possibility of analyzing the cause of low or poor productivity.

SCENARIO OF INDIAN TEXTILE INDUSTRY

Most of the textile plant in India are still having old technologies and running their plants in very low efficiency.

Automation can improve the productivity of even old machinery and enhance the quality of the product. For example-

a) Ring frame automation can improve the doffing time, reduce unnecessary breakdowns because of power fluctuation and record the exact running procedure by avoiding manual interference. It can reduce the production cost by reducing manpower.

SCENARIO OF INDIAN TEXTILE INDUSTRY

b) Automation of weaving machineries can improve to analyze the reason of breakdowns, improves the life of the machine by controlling all critical mechanical settings and provide accurate data of the machine.

c) The very important area for Automation is the dyeing process, because it involves lot of minute parameters which are very critical. Even in milligrams variation of recipe can change the shade of the fabric. All the parameters for dyeing like temperature, pressure, water level, water flow, circulation and time of treatment are most important.

Automation of the dyeing process can improve the productivity by controlling the above parameters very accurately.

SCENARIO OF INDIAN TEXTILE INDUSTRY

d) The finishing process is very critical and all the parameters of the machine needs to control preciously. Chemical dozing should also needs accurate measurement. Automation helps to improve all these parameters and improves the productivity and quality in a great extent.

e) Even the folding and warehouse operation can improve by Automation of the process.

How to proceed for automation

- Do you know where you are?
- Do you know where you want to be ONE year from Now?
- Do you know where you want to be FIVE years from Now?

How do we start

- It is very important to identify the need and the feasibility of the system to be automated

- The production cost, the complicity of the machines, the utility requirement of the machines, quality parameters of the products are most important factors to consider while planning for Automation.

Select The System which has Flexibility

- Ease of Programming
- Adaptability to change
- Expandability
- Enhanceability of function.
- Ruggedness in system.
- Service Back up.

PERFORMANCE FACTOR

- Response Time
- Reliability
- Maintainability
- Availability
- Capability

To perform the desired task.

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REQUIREMENT OF AUTOMATION

- PLC
- Sensors
- Actuators
- Drives
- SCADA
- Networking

Automation In Textile Industry

The textile manufacturers were having problems with the controls on Textile Machinery as they were having proprietary communication and programming standards. Therefore the American Textile Manufacturing Institution along with the Computer Instruments Manufacturing sub-committee have designed a open communication standard. Use of this will help significantly in implementing Integration and Automation strategies.

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The open definable standards for communications and programmability will give textile manufacturers the ability to implement plant wide strategies, without asking the OEM for source code and expensive reprogramming.

Case Studies

I will show you some case studies where Raymond Limited has improved their productivity to a great extent by Automating their existing machines and processes.

ROPE SCOURING AUTOMATION

- **APPLICATION**

- We have Rope Scouring m/c for secondary washing & softening of fabric. The fabric gets stiffed after the process of singeing and heat setting. This fabric is treated with chemical in the rope scouring machine to remove stiffness as well as stains.

NEED

Earlier Operation of machine was manual. There were lot of problems/negligence during operation of the machine and it is not traceable easily. The whole system was studied by group of engineers. The study reveled that the inconsistency in fabric was due to the following points

- Cycle Time.
- Quantity of chemical added
- Quantity of water taken.
- Speed of machine.
- Temperature of m/c.

SOLUTION

- To automate the m/c it was decided to use distributed control system, and then all the m/c were connected to central SCADA system. Individual m/c is automated and connected through Ethernet link. For automation the hardware used were DP transmitter, Temperature sensor and transmitter, Level switch etc. The electrical panel for this automation was designed and built In house.

- Total 50 nos of programs are made to fulfill the requirement of process according to quality of fabric. According to lot data and program number the m/c runs in auto mode and the chemical request is send to dispenser accordingly.

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ADVANTAGES

- Consistent quality is maintained.
- The water consumption is reduced by 2 lacs lit/day.
- Manpower is reduced by 27 workmen out of 38 workmen
- Chemical saving is achieved up to 12%.
- The track of process and record keeping is easier.
- The energy consumption is reduced.
- The fault finding is easier due to which less downtime is observed.
- The manual error is avoided.

Automation of Chemical Dispensing System

- The Application
- We have rope scouring m/c for secondary washing of Fabric. After the Singing and Heat setting the fabric gets stiff so the fabric is treated and washed here for wool setting and soft touch. Four types of chemicals are used for this purpose.
- Non Ionic Detergent
- Non Ionic Softener
- Soda
- Acetic Acid

The Need

Previously the m/c were running in manual mode and the chemical were added through Jars and Buckets . Chemicals were added according to slab of 50 kg lot. This was crude method. Due to this there was lot of variation in Quality of fabric.

Also there was very high potential of saving the chemicals. So to optimize the resources Automatic Dispensing System was a good option.

The Solution

- A team of engineering comprising of Mechanical ,Electrical, Instrumentation as well as Process engineer studied together and came out with a solution which was very accurate and user Friendly.
- The system is divided into 2 Parts.
- **Chemical Preparation and Loading**
- **Dispensing system**

Loading Station

The Quantity of chemical to be loaded in Storage tanks is entered into the Computer and automatically the water to be loaded is calculated . The chemical and water loading is done through constant flow gear pump. The magnetic flow meter is installed in delivery of gear pump which measures the quantity to be loaded accurately.

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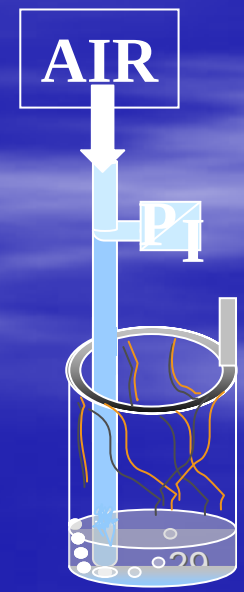
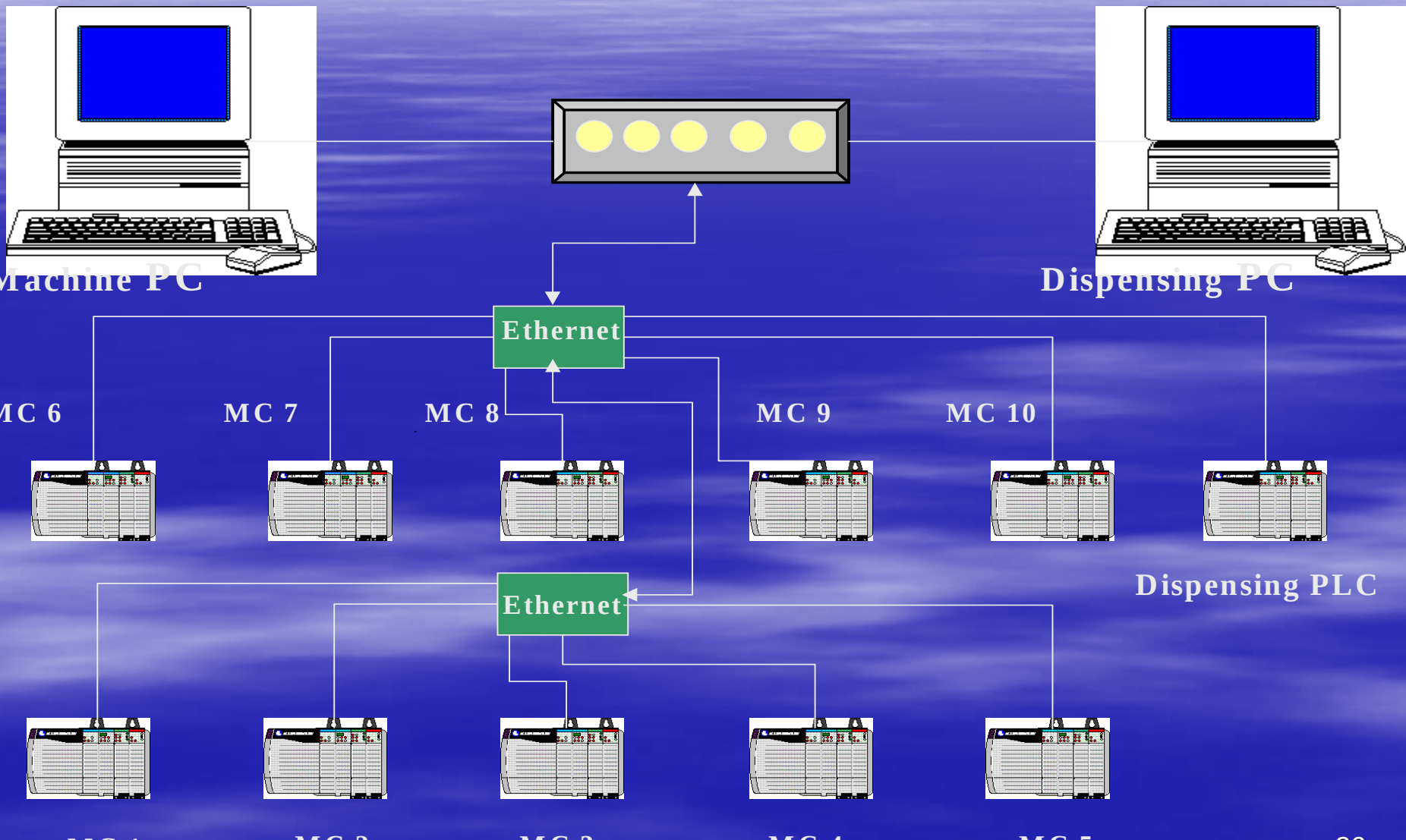
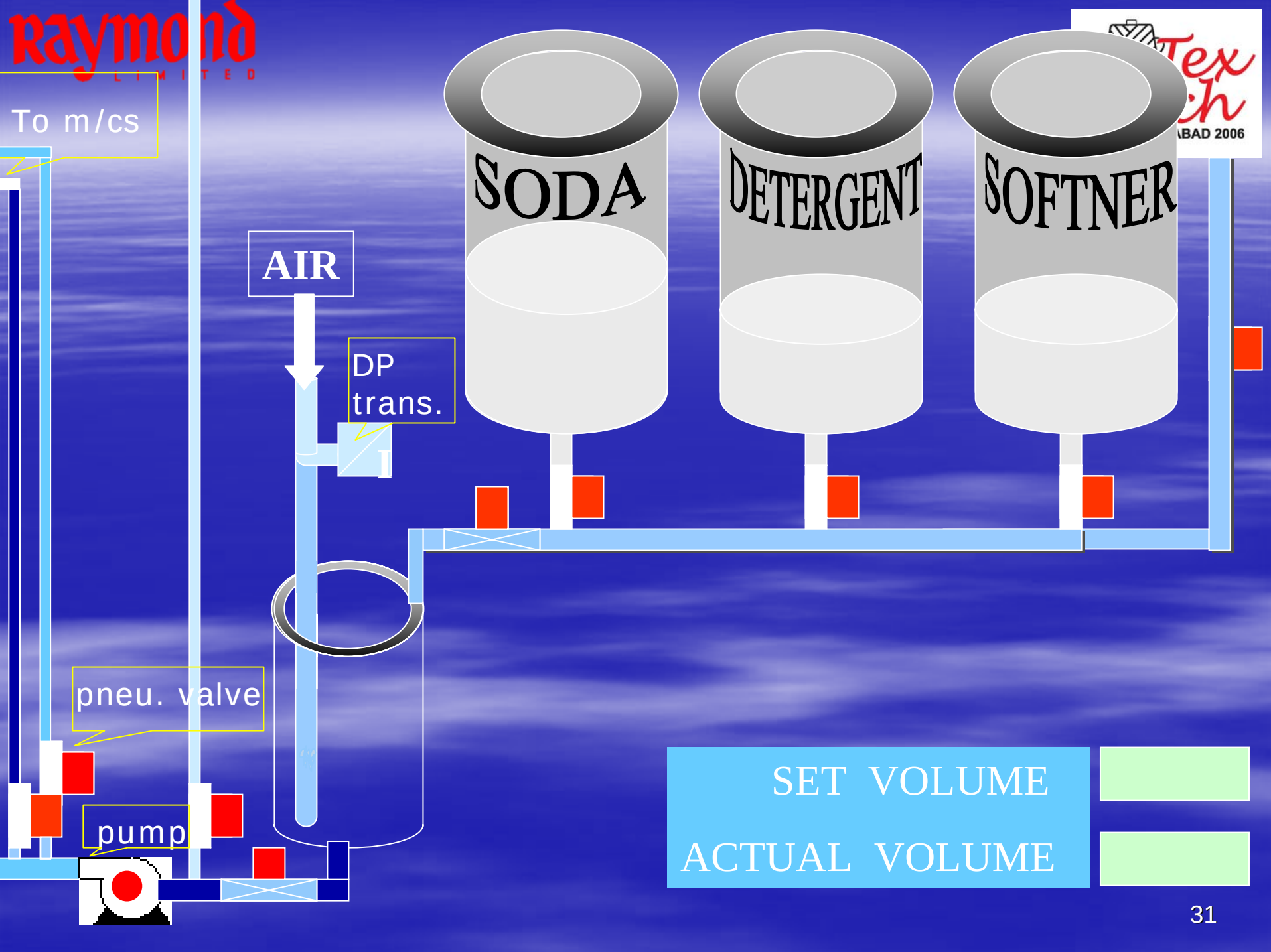
Dispensing System

As per the program no. and the weight of the lot, chemicals requirement is computed and a request is send to the PLC of dispenser by the PLC of m/c. Which in turns send the required quantity of chemical to the dispensing PLC. Once the PLC gets call from the m/c the valve of the particular chemical tank dose the chemical to the open tank. The open transmitter measures mass of the chemical and gives feed back to the PLC. DP Transmitter on the theory of "Bubbler System" in open Vessel does the measurement of chemical.

As soon as the measurement is over, the water flushing valve flushes the entire System. This chemical and water is transferred to m/c through Centrifugal Pump. After dispensing the chemical & water, the air is blown in the pipe so that no residuals remain in pipe.




Machine PC
Dispensing PC
Ethernet
MC 6
MC 7
MC 8
MC 9
MC 10
Dispensing PLC
Ethernet
MC 1
MC 2
MC 3
MC 4
MC 5


To m/cs
AIR
DP
trans.
SODA
DETERGENT
SOFTNER
pneu. valve
pump
SET VOLUME
ACTUAL VOLUME

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AIR WASHER TOWER AUTOMATION

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CONCEPT of automation was to centralize the monitoring and control of all the towers from one place and keeping in view of the Energy conservation aspect. All the systems, available in the market at present use the custom built controller. Energy conservation aspect is also not considered whereas in our system, we have used PLC and the software logic with a view to conserve energy without compromising the departmental requirement for Relative Humidity and temperature.

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Central Monitoring and control

In this system all the towers are connected to the central control room through Ethernet LAN. All the towers are monitored and controlled from one computer.

SCADA software is loaded in the PC to acquire and store the data of various towers. This data is processed and then displayed on the screen. Different screens are developed to view the status like Trend, settings etc. The settings for different process parameters and the Dampers Position of all the Towers can be changed from the central control Room. Also reports are generated to give the status of individual user departments. On the mimic page, we can view the actual running of the tower.


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RSView32 Runtime 5K - [sp & status - Display]
DATE 13: 5: 2003
TIME 4:16:27 PM
SETPOINT & STATUS AWT 3
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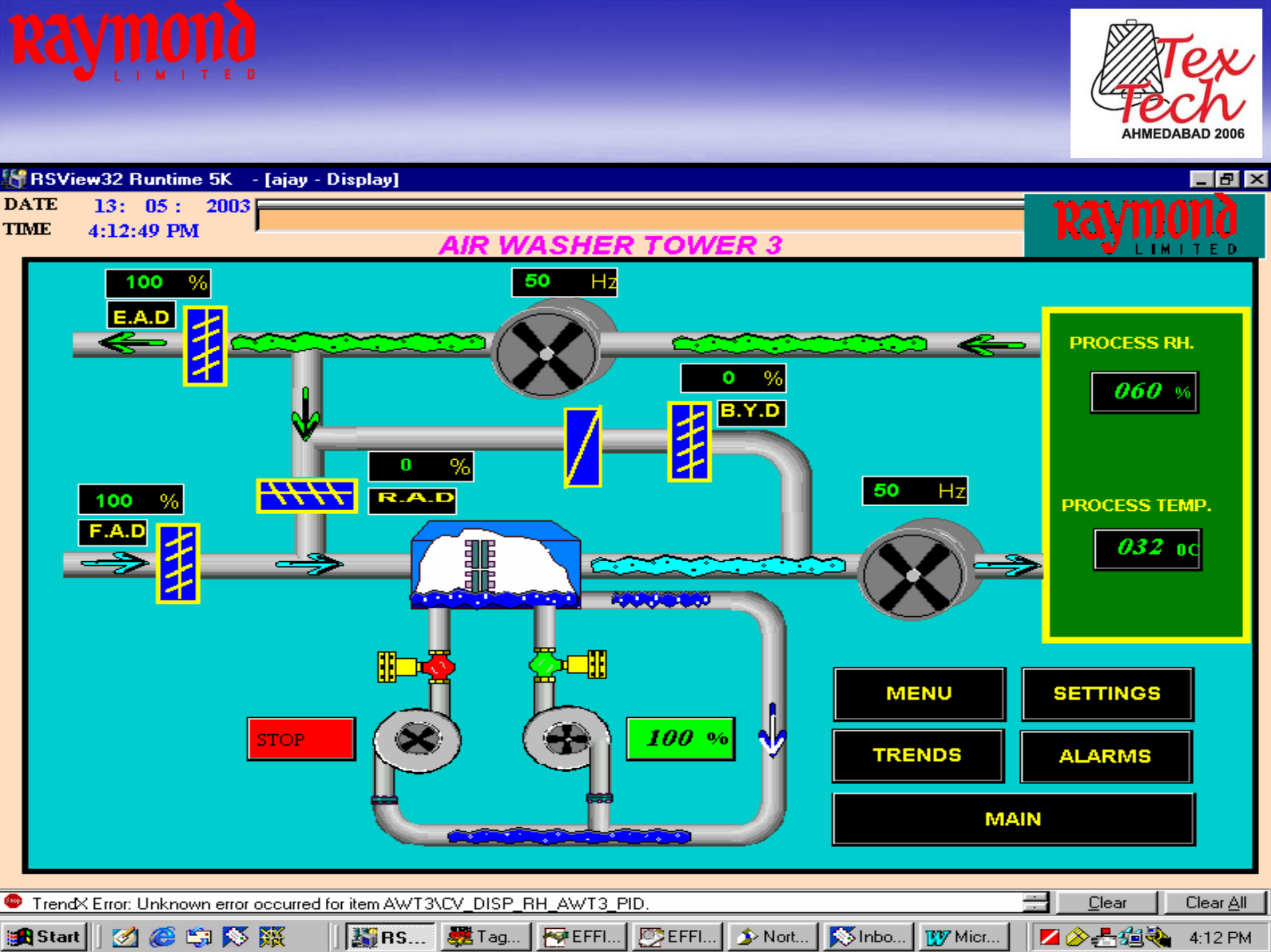
LIMITED
PARAMETERS
ACTUAL
SETPOINT
PROCESS RH
060 %
058 %
PROCESS TEMP.
032 0C
031 0C
AMBIENT RH
023 %
AMBIENT TEMP.
107 0F
PUMP1 STATUS
STOP
PUMP2 STATUS
100 %
S.A.F. INVERTOR
100 %
R.A.F. INVERTOR
100 %
TIME
% OPEN
ACTUAL
SETPOINT
BY.AIR DAMPER
000 %
04 Hrs
14 Hrs
EXH.AIR DAMPER
100 %
06 Hrs
15 Hrs
FRESH AIR DAMPER
100 %
12 Hrs
14 Hrs
RET. AIR DAMPER
000 %
07 Hrs
16 Hrs
MANUAL OPERATION
PUMP1 MAN OFF
PUMP2 MAN OFF
RF MAN OFF
SF MAN OFF
MAIN
MENU
ALARMS
TRENDS
SETTINGS
TOWER AUTO ON
display main
Clear
Clear All
Start
RS...
Tag...
EFFI...
EFFI...
Nort...
Inbo...
Micr...
4:16 PM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RSView32 Runtime 5K - [ajay - Display]
DATE 13: 05 : 2003
TIME 4:12:49 PM
AIR WASHER TOWER 3
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100 %
E.A.D
50 Hz
0 %
B.Y.D
0 %
R.A.D
100 %
F.A.D
50 Hz
PROCESS RH.
060 %
PROCESS TEMP.
032 0C
STOP
100 %
MENU
SETTINGS
TRENDS
ALARMS
MAIN
TrendX Error: Unknown error occurred for item AWT3\CV_DISP_RH_AWT3_PID.
Clear
Clear All
Start
RS...
Tag...
EFFI...
EFFI...
Nort...
Inbo...
Micr...
4:12 PM

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RSView32 Runtime 5K - [Trend AWT3_Invr - Display]

DATE 13: 5: 2003

TIME 4:26:38 PM

TREND PUMP & INVERTOR AWT3

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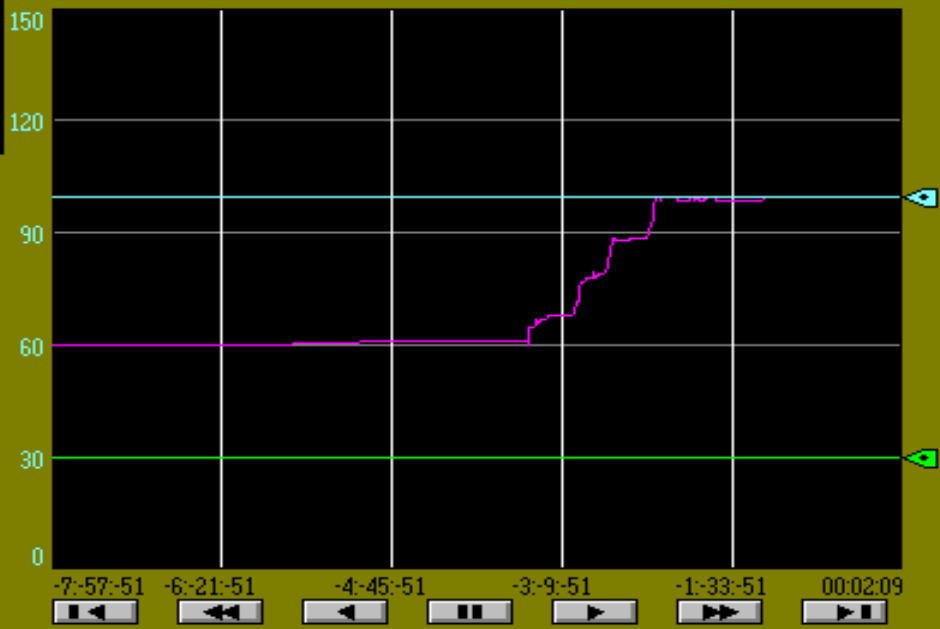
SAF & RAF INVR. AWT3	%	150 0
PUMP2 AWT3	%	150 0
PUMP1 AWT3	%	150 0



Process Trend AWT3

MAIN | MENU | ALARMS | SETTINGS | TRENDS

TrendX Error: Unknown error occurred for item AMBT_TEMP.

Clear | Clear All

Start | RS... | Tag... | EFFI... | EFFI... | Nort... | Inbo... | Micr... | 4:26 PM

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RSView32 Runtime 5K - [trend awt3 - Display]

DATE 13: 5: 2003

TIME 4:17:18 PM

TRENDS AWT3

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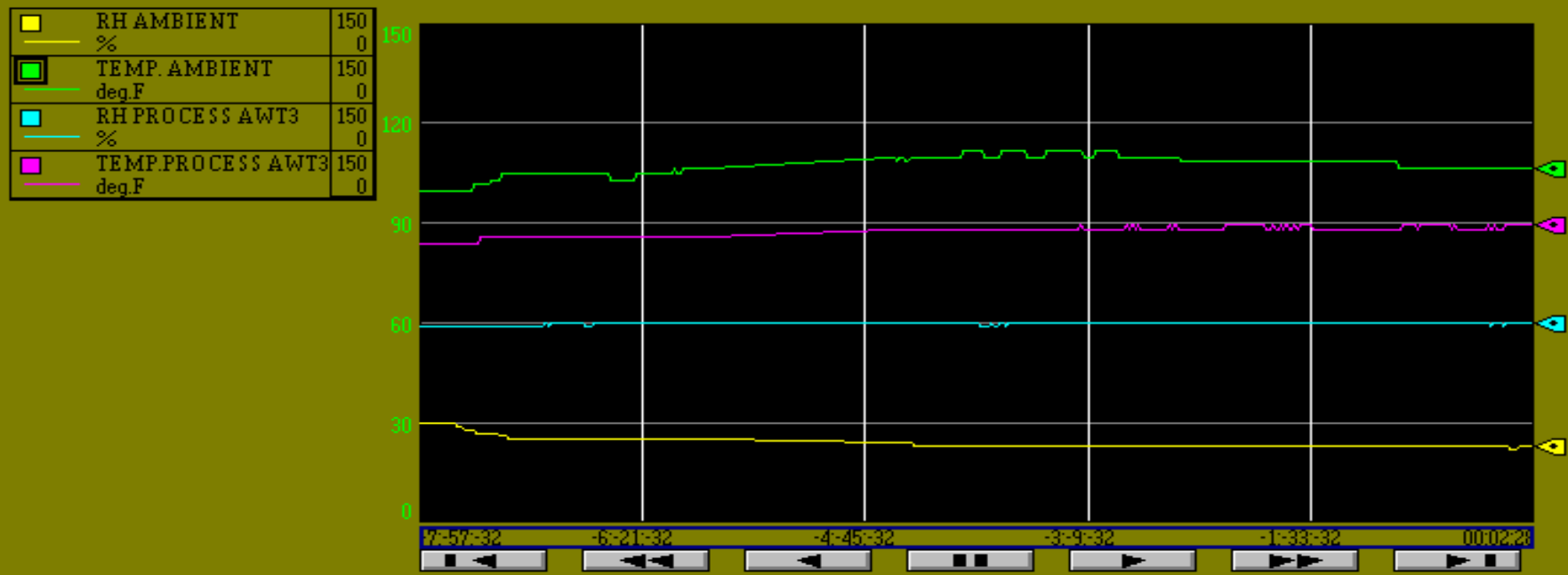

Trend AWT3 Pump & Invt.

Trend AWT4 Pump & Invt.

MAIN | MENU | ALARMS | SETTINGS | TRENDS

display main

Clear | Clear All

Start | RS... | Tag... | EFFI... | EFFI... | Nort... | Inbo... | Micr... | 4:17 PM

Netscape

File Edit View Go Communicator Help

Back Forward Reload Home Search Netscape Print Security Shop Stop

Bookmarks Location: /jmjoshi/mail/Inbox?id=3EC0B77F.928308D7%40raymondindia.com&number=485804412&part=1.2 What's Related

Instant Message WebMail Contact People Yellow Pages Download Find Sites Channels

	AMBT_RH	AMBT_TEMP	AWT3\RH	AWT3\TEMP	AWT4\RH	AWT4\TEMP
5/12/2003 2:38:22PM	22.00	107.00	58.00	90.00	62.00	93.00
5/12/2003 3:38:25PM	22.00	107.00	57.00	88.00	60.00	95.00
5/12/2003 4:38:26PM	22.00	103.00	59.00	88.00	61.00	93.00
5/12/2003 5:38:29PM	22.00	100.00	59.00	88.00	61.00	93.00
5/12/2003 6:38:29PM	24.00	95.00	59.00	88.00	61.00	91.00
5/12/2003 7:38:29PM	28.00	92.00	59.00	88.00	62.00	90.00
5/12/2003 8:38:29PM	30.00	90.00	59.00	86.00	63.00	90.00
5/12/2003 9:38:29PM	31.00	88.00	58.00	88.00	63.00	90.00
5/12/2003 10:38:30PM	33.00	86.00	58.00	88.00	66.00	88.00
5/12/2003 11:38:30PM	35.00	83.00	58.00	88.00	66.00	88.00
5/13/2003 12:00:13AM	35.00	83.00	58.00	88.00	66.00	88.00
5/13/2003 12:38:31AM	35.00	81.00	58.00	88.00	66.00	88.00
5/13/2003 1:38:31AM	36.00	81.00	58.00	86.00	66.00	86.00

124% 1 of 2 8.5 x 11 in

Document: Done

Start RS... Ta... EF... EF... No... Inb... A... N... 4:31 PM

EXAMPLE OF ENERGY SAVINGS DUE TO AUTOMATION OF AWT

AWT – 1

Capacity – 2,40,000 CMH

AWT – 2

Capacity – 2,40,000 CMH

	Unit Consumption for AWT - 1 (For 1 month)	**Unit Consumption For AWT – 2** (For 1 month)
Before automation	75360 kwh	86160 KWH
After automation	65744 KWH	76864 KWH
Net savings	9616 KWH	9296 KWH
***Annual Saving**	**70000 KWH**	**70000 KWH**

*considerable saving is in the period of Aug to March.

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AUTOMATION OF DYEING PROCESS

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Dyeing process whether it is piece dyeing, top dyeing or cheese dyeing the time factor, the cooling - heating cycle and correct quantity of chemicals and dyes is very important. Dyeing process consists of many different steps. The process also differs from lot to lot. As the system was totally manual the rate of human error and wastage is very high leading to variation in shed.

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To avoid these all it is decided to have automatic color and chemical dispensing system. In the first phase all the machines were automated in-house by multiprogramming. For the automation, we have changed the internal piping system and the safety requirement. The complete process is studied for the programming.

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After completion of all machine automation, the color service system is installed. Color Service system handles the chemical & dyes and dispenses as per the exact requirement of machine. All the machines were connected with color service through pipe line

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ADVANTAGES

- Reduction in water consumption.
- Consistency in quality.
- Saving in chemical & dyes consumption.
- Manpower reduction.
- Elimination of reprocessing.
- Recording is easier.

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BOILER AUTOMATION

The Application:

We have a dual fired 10TPH Boiler which Runs to full fill the requirements of a Finishing, Dyeing and other Departments.

BOILER AUTOMATION

The Need:

Since the textile industry is a batch process type there is a huge Load fluctuation ranging from 30% to 120%. The Boiler attendant use to operate boiler manually looking to the load pattern,. So there was a high saving potential by automating the system.

Boiler Capacity (TPH)	Coal Savings (Rs. / annum)	Coal Payback (months)	Oil Savings (Rs. / annum)	Oil Payback (months)	Natural Gas Savings (Rs. / annum)	Natural Gas Payback (months)
1	1,20,772	37	1,50,872	30	91,491	49
2	2,41,543	19	3,01,744	15	1,82,982	25
3	3,62,315	13	4,52,617	10	2,74,473	17
4	4,83,086	10	6,03,489	8	3,65,964	13
5	6,03,858	8	7,54,361	6	4,57,455	10
10	12,07,716	4	15,08,722	3	9,14,910	6
15	18,11,574	3	22,63,083	2	13,72,364	4
20	24,15,432	2	30,17,445	1.5	18,29,819	3
25	30,19,290	1	37,71,806	1	22,87,274	2.5

Basis of Calculations

Coal	Oil	Natural Gas
Efficiency improvement from 70% to 73% GCV = 4,200 kCal/kg Cost = Rs. 2000 per ton	Efficiency improvement from 80% to 83% GCV = 10,100 kCal/kg Cost = Rs. 11000 per ton	Efficiency improvement from 79% to 82% GCV = 9,600 kCal/Nm^3 Cost = Rs. 4.5 per Nm^3

Operating hours per annum = 8000

* The above prices are average prevailing domestic prices

NEED OF THE DAY

- Automation is a need for today's competitive market where quality, cost and availability is playing major role.

- Through Automation only we can achieve these parameters and compete in the market.

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Thanks