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Electro Steel Final Report (Page 1)

REPORT

CONVERSION OF

ELECTRO STEEL Co.

HOT CHAMBER

FINAL REPORT

Contract No. 99/093P

UNIDO's PROJECT No. MP/IRA/97/196

2 Dec. 99

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SYNOPSIS

Under supreme supervision of **UNIDO** the **CFC** phase project has been implemented in Iran to phase out 100 % ODS in some Iranian White Industries

The project No. **MP/IRA/97/196** has been nominated to Islamic Republic of Iran for the Multilateral Fund for the implementation of The Montreal Protocol Financing.

The project was approved by Montreal Protocol Multilateral Fund executive committee. The project was actually started in November 1994, but the implementation of the project has been already started from January 1994, by recommendation of Montreal Protocol and request of Government of Islamic Republic of Iran, the refrigerant R134a was finally approved and selected by **UNIDO** as an alternative for refrigerant R12.

Electro Steel Co. As a home appliance and Industrial Refrigerator manufacturer in Iran the main activities of *Electro Steel Co.* , is producing refrigerators and freezers,

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INTRODUCTION

According to **UNIDO** contract No. **99/093P** with Industrial Control Research Center Co. (**ICRC**) the existing *Electro Steel Co.* hot chambers facilities shall be converted and modified to phase out CFC-12 and suitable for **R134a** refrigerant to perform functionality and performance test of converted refrigerators and complying with ISO standards 7173, 8187, and 5155.

- 1 This proposal has been prepared based on the requirements of Islamic Republic of Iran indicated in the country program no *UNEP/OZL.PRO/EX COM/10/24* dated 27 May 1993 prepared by **UNDP**.

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- 2 The CFC phase out project in *Electro Steel Co.* will enable *Electro Steel Co.* to convert the existing production line facilities and existing hot chambers into Non CFC production line, using **R134a** refrigerant.

- 3 The converted Hot Chamber Installations will provide more than 20 data points in the refrigeration circuit this means more information and the ability of analyzing refrigeration system and new refrigerant effect.

- 4 The reconstructed Hot Chamber will be able to check and test 2 refrigerator and/or ref.-freezers units at the same time. The same equipment and data processing system, as will be used at plant test room will be installed in this chamber.

- 5 The immediate effect of this project at *Electro Steel Co.* is to perform all required check and tests, suitable for Refrigerator & Freezers using Ozone Friendly Gases. The existing test facilities in *Electro Steel Co.* are not adequate for check and testing, converted ref. and freezer units, in addition to that the hot rooms are not able to perform Energy Consumption and Optimization Program.

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ICRC Hot Chamber Characteristics

In order to convert *Electro Steel Co.* hot rooms facilities , ICRC shall provide following services:

- Supply of new equipment.
- Redesign of old equipment
- Delivery of technical drawings and software.
- Installation and commissioning.
- Start-up of the equipment and the technology.
- On-the-job training of the plant personnel.

With respect to **ISO** standards test requirements, and for the purpose of functionality and performance tests of the new redesigned Refrigerator and Ref.-Freezers using R134a refrigerants. The existing hot room in *Electro Steel Co.* is being converted and equipped in such a way to enable *Electro Steel Co.* to check and test at least one different models of refrigerators and freezers at ambient temperature 32 to 43 degree centigrade at one hot room chambers . In addition to these services is providing. But the hot room is capable to test eight refrigerators and freezers in case of adding more transducers and sensors in the main panel in the hot room:

- a) Procurement of new test measurement and data processing equipment.
- b) Redesign and rebuilding of presently used equipment and installation.
- c) Installation, commissioning, trial operation, start-up and on-the-job training

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ELECTRO STEEL HOT CHAMBER TECHNICAL SPECIFICATION

As previously mentioned, *Electro Steel Co.*'s plant is producing 50 refrigerator daily. And subsequently the hot chamber should have been able to cover plant daily test requirement as well as other activities. Therefore, the converted hot chamber should respond to all test requirement and be able to meet ISO standards numbers 7371, 5155, 8187 as set forth in the contract and IJISI, Iranian standards numbers 254, 2482, 2818. The plant hot chamber technical specification are as follows:

- Hot Chamber Dimension about 3 mt. by 3 mt.
- Refrigerator test ability simultaneously, 2 units and ability to test 6 sample out of the room
- Ability to perform following operational tests and report:
 - 1 - Pull down test.
 - 2 - Continuous run test.
 - 3 - Cyclic run test.
 - 4 - Ice Freeze test.
 - 5 - Energy consumption test

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- 20 Measuring points, including. (for each applia.)

- 1 - Humidity, one point for one hot room.
- 2 - Compressor Power, 2 point
- 3 - Motor current, 2 point.
- 4 - Supply Voltage, 2 point.
- 5 - Hot chamber air temperature reading, one point.

160 points for eight models in case of improving the system by spending very low costs.

- Computerized graphical diagram of the refrigerator performance data sheet.
- Test measurement tolerance for temperature reading 0.3 degree centigrade.
- Computerized data processing system.
- Full color test sheet system reporting.

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- On screen and data reporting system ability with following characteristics;

- 1 - Test number.**
- 2 - Product name.**
- 3 - Product model**
- 4 - Product internal volume**
- 5 - Compressor name**
- 6 - Compressor model**
- 7 - Compressor cooling capacity**
- 8 - Compressor current**
- 9 - Thermostat setting**
- 10 - Thermostat type.**
- 11 - Total test running time.**
- 12 - Ambient temperature.**
- 13 - Voltage rating**
- 14 - Working percentage**

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- 15 - Evaporator mean air temperature**
- 16 - Cabin mean temperature**
- 17 - Evaporator bulb temperature**
- 18 - Crisper temperature.**
- 19 - Actual compressor running time**
- 20 - Energy consumption**
- 21 - Compressor motor winding temperature**
- 22 - Compressor shell temperature.**
- 23 - Compressor discharge temperature.**
- 24 - Condenser inlet temperature.**
- 25 - Condenser out let temperature.**
- 26 - Condenser mid temperature**
- 27 - Evaporator inlet temperature**
- 28 - Evaporator outlet temperature.**
- 29 - Freezing temperature.**
- 30 - Refrigeration system condition display.**

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ACTIVITIES

The following activities were accomplished so far toward achievement of the contract requirement as set forth by **UNIDO** and the counterpart.

- 1 - Planning for;
 - a) Hot chambers system management.
 - b) Hot chambers graphic display management.
 - c) Hot chambers calibration setting parameters.
 - d) Hot chambers test standards management
- 2 - Preparing material requirement list.
- 3 - Component and material supply source evaluation.
- 4 - Technical data collecting.
- 5 - Engineering drawing for electronic and electrical system
- 6 - Hot chamber design review.

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- 7 - Data processing software planning.
- 8 - Data processing hardware planning.
- 9 - Thermal amplification electronic cart design
- 10 - Preparation of timer 1 flow chart..
- 11 - Initial test of data loggers electronic cart.
- 12 - Initial connection of data loggers to the computers.
- 13 - Interface electronic cart design for PC and operating system.
- 14 - RTX3 electronic diagram design.
- 15 - RTX electronic diagram design.
- 16 - UNIDO, CRC - 386 design.
- 17 - UNIDO, TC- 100 design.
- 18 - UNIDO, in-out CRC design.
- 19 - Preparation of operating system display flow chart.

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20 - Visits and coordination;

20/1 :

- Visiting plant One day, One engineer, one time.
- Visiting and coordinating with UNDP office .
- Technical negotiation with *Electro Steel Co.* engineers and hot chamber in order to coordinate activities.
- Advising for the necessary modification on the Room .

20/2 :

- Visiting plant 3 days , 5 engineer and Technician, one time.
- Installation Electronic Panel
- Installation Electrical Panel
- Completing The Room
- Starting Test
- Controlling Condition Of the Room
- Testing 2 Samples for Energy Consumption
- Testing 2 Samples for Performance Test
- Testing 2 Samples for Fume Quality
- Teaching the technical Test

20/3 :

- Visiting plant 2 days , 2 engineer and One Technician, one time.
- Testing Controlling Condition Of the Room
- Testing 2 Samples for Energy Consumption
- Testing 2 Samples for Performance Test
- Testing 2 Samples for Fume Quality
- Teaching the technical Test

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- Visiting and coordinating with **UNDP office** .
- Technical negotiation with *Electro Steel Co.* engineers and hot chamber in order to coordinate activities.
- Advising for the necessary modification on the Samples .

21 - Soft Ware :

- data gathering
- calibrating
- printing
- editing
- humidi curving
- self checking

All software are installed and Started

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SUPPLY PARTS AND MATERIALS

In order to fabricate components and electronic kits following material and parts have been purchased so far.

- 1 - Semiconductor sensors for measuring temperature from - 30 to + 110 degree centigrade. 32 each
- 2 - Electronic humidity measurement sensor 1 each
- 3 - Electronic data logger cart for temperature measurement 2 each
- 4 - Electronic data logger cart for humidity Calibration 1 each
- 5 - ADC912 Converter IC for system conversion management.
- 6 - Electronic parts consist of resistor. IC, capacitor, and diode.
- 7 - Main Electronic Data Log
- 8 - (2*24) Electronic Sensors for Thermal Measuring
- 9 - (2*4) Electronic Sensors for Thermal Measuring of Condenser
- 10 -Heater Controller contractors

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ICRC

**Industrial Control
Research Center**

```
Sub Load_Spec ()
```

```
    Dim a50 As String * 50
```

```
End Sub
```

```
'
```

```
'
```

```
Sub Noc_MouseDown (b As Integer, S As Integer, X As Single,  
Y As Single)
```

```
End Sub
```

```
'
```

```
'
```

```
Sub NocPnl_MouseDown (b As Integer, S As Integer, X As  
Single, Y As Single)
```

```
    nn = NocPnl.Height / 4
```

```
    If (Y < nn) And (CopyNumber > 1) Then
```

```
        CopyNumber = CopyNumber - 1
```

```
    ElseIf (Y > (nn + nn + nn)) And (CopyNumber < 3) Then
```

```
        CopyNumber = CopyNumber + 1
```

```
    ElseIf (CopyNumber < 1) Then
```

```
        CopyNumber = 1
```

```
    ElseIf (CopyNumber > 3) Then
```

```
        CopyNumber = 3
```

```
    End If
```

```
    NocPnl.Caption = ".Copy No.=" & CopyNumber
```

```
End Sub
```

```
'
```

```
'
```

```
'
```

```
Sub PageTest_Click ()
```

```
    PageTestNameTxt.Text = PageTest.Caption
```

```
    PageTestNameTxt.Visible = True
```

```
    PageTestNameTxt.SetFocus
```

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End Sub

'
'

Sub PageTestNameTxt_KeyDown (KeyCode As Integer, Shift As Integer)

```
If KeyCode = 13 Then
    PageTest.Caption = PageTestNameTxt.Text
    PageTestNameTxt.Visible = False
End If
```

End Sub

'-----

'

Sub Print_All ()

```
screen.MousePointer = 11
sl = 0
st = -8 '-3
sw = 210 '202
sh = 280'275'280
dw = 1
printer.ScaleLeft = sl
printer.ScaleTop = st
printer.ScaleWidth = sw
printer.ScaleHeight = sh
printerdrawwidth = dw
armic.Picture = Hr.FactoryIcon.Picture
first = 0
If Spec_chk.Value = True Then
    Call PrintArm(0)
    Call PrintVersion
    Call PrintProductSpec
    Call PrintResult(0)
    Call PrintRemark
    Call PrintName
    first = 1
End If
If Graph_chk.Value = True Then
    For page = 1 To PrnPageNo
```

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If first = 0 Then first = 1 Else printer.NewPage

```
printer.ScaleLeft = sl
printer.ScaleTop = st
printer.ScaleWidth = sw
printer.ScaleHeight = sh
printerdrawwidth = dw
```

```
Call PrintArm(CInt(page))
Call PrintVersion
Call PrintResult(CInt(page))
Call PrintShape(CInt(page))
Call PrintCrv(CInt(page))
```

Next page

```
End If
printer.EndDoc
screen.MousePointer = 0
```

End Sub

'-----

'

Sub PrintArm (page As Integer)

```
X0 = 0
y0 = 0
armic.Visible = True
sl = printer.ScaleLeft
st = printer.ScaleTop
sw = printer.ScaleWidth
sh = printer.ScaleHeight
printer.ScaleMode = 3
printer.Print ""
rx = printer.ScaleWidth / sw
ry = printer.ScaleHeight / sh
W0 = printer.ScaleWidth
H0 = printer.ScaleHeight
left0 = 171 * rx
Top0 = 10 * ry
X = PrintWindow(printer.hDC, left0, Top0, W0 * 1.75, H0
* 1.75, armic.hWnd)
'left0 = 171 * rx
'Top0 = 12 * ry
```

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ICRC
Industrial Control
Research Center

```
'X = PrintWindow(printer.hDC, left0, Top0, W0 * 1, H0 * 1,
armic.hWnd)
    armic.Visible = False
    printer.ScaleLeft = sl
    printer.ScaleTop = st
    printer.ScaleWidth = sw
    printer.ScaleHeight = sh
    armic.Visible = False
    printer.DrawWidth = 4 * printerdrawwidth
'Print_arm
    printer.ForeColor = Blue
    printer.Line (15, 0)-(200, 270), , B           'BOX
AROUND SHEET
    printer.Circle (5, 103), 3
    printer.Circle (5, 183), 3
    Y = 155
    printer.DrawWidth = 3 * printerdrawwidth
    X0 = 174
    y0 = 5
    printer.Line (15, 30)-(200, 30), Magenta      'only
red
    printer.FontName = "arial"
    '-----
    printer.FontSize = 7
    printer.FontBold = True
    printer.ForeColor = Black
    printer.CurrentX = 20
    printer.CurrentY = 2:                          printer.Print
"Printing in Labaratory Of"
    printer.CurrentX = 20
    printer.CurrentY = 6:                          printer.Print
Factory
    '-----
    printer.FontSize = 19
    printer.FontBold = True
    printer.ForeColor = Green
    printer.CurrentX = 70
    printer.CurrentY = 3:                          printer.Print
Factory0
    Y = 1 + printer.TextHeight(a$) + 4
    printer.FontSize = 11
    printer.FontBold = True
```

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```
a$ = "TestDate:"
printer.FontItalic = True
printer.ForeColor = Cyan
printer.CurrentX = 20
printer.CurrentY = 18: printer.Print a$
b$ = grffile
a$ = Mid(b$, 1, 2) & "/"
a$ = a$ & Mid(b$, 3, 2) & "/"
a$ = a$ & Mid(b$, 5, 2) & " "
a$ = a$ & Mid(b$, 7, 2) & ":"
a$ = a$ & Mid(b$, 11, 2)
printer.FontItalic = False
printer.ForeColor = Black
printer.CurrentX = 45
printer.CurrentY = 18
printer.FontSize = 13: printer.Print a$

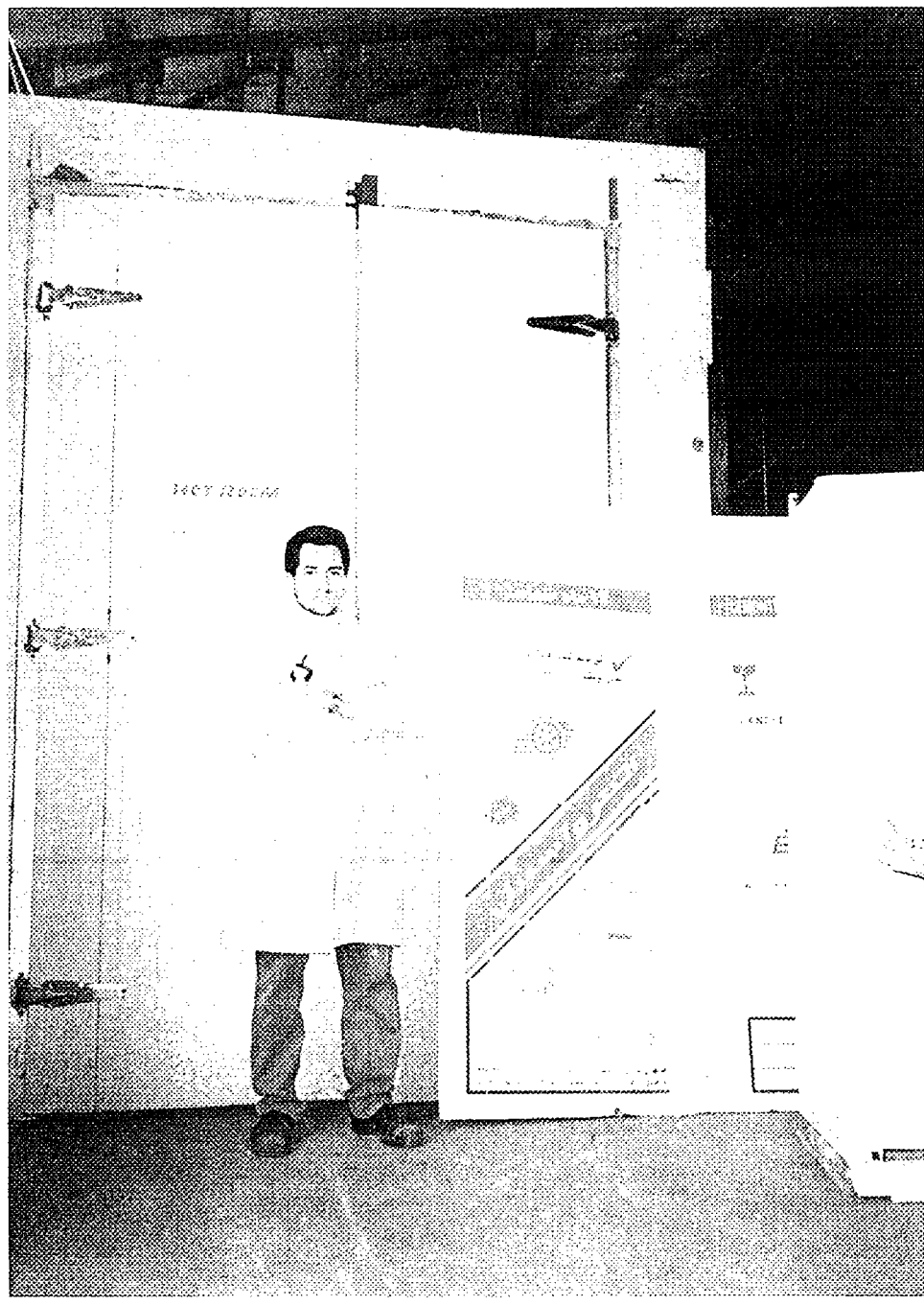
printer.FontSize = 11
a$ = IIf(page = 0, "TestName:", "PageTestName:")
printer.FontItalic = True
printer.ForeColor = Cyan
printer.CurrentX = 20
printer.CurrentY = 24: printer.Print a$

a$ = PageTest.Caption ' "Cycling
Performance"
printer.FontItalic = False
printer.ForeColor = Magenta
If page = 0 Then
    printer.CurrentX = 45
Else
    printer.CurrentX = 60
End If
printer.CurrentY = 24: printer.Print a$

a$ = "Report No.:"
printer.FontItalic = True
printer.ForeColor = Cyan
printer.CurrentX = 110
printer.CurrentY = 18: printer.Print a$
If page = 0 Then
    a$ = "Spec & Remark"
Else
```

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ICRC

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ICRC

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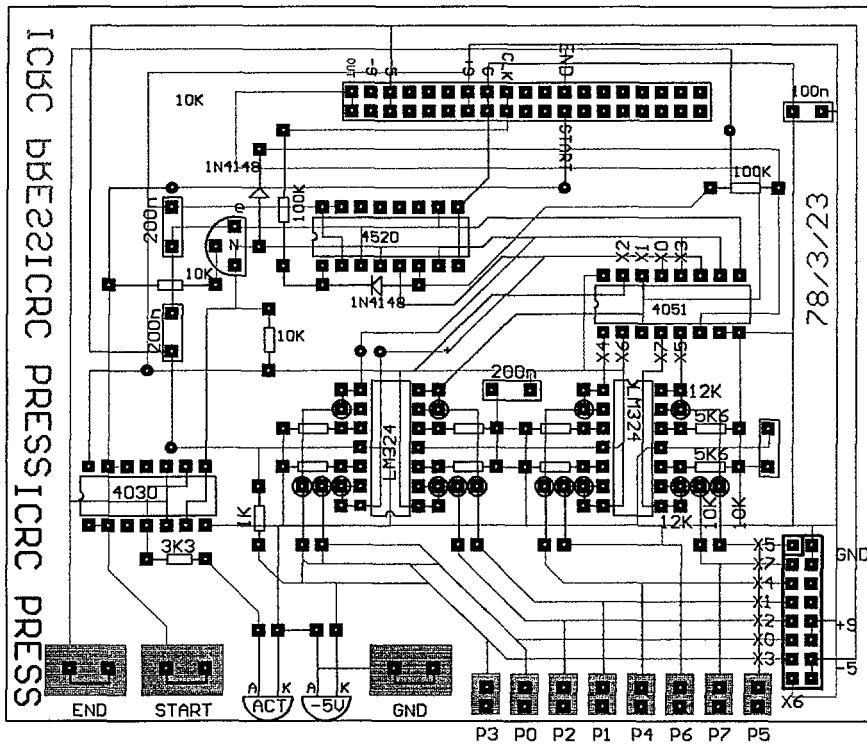


Engineer Miss A'ZAM BARATI

Industrial FRIZER PRODUCTION MANAGER
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TestDate: 78/07/12 08:12

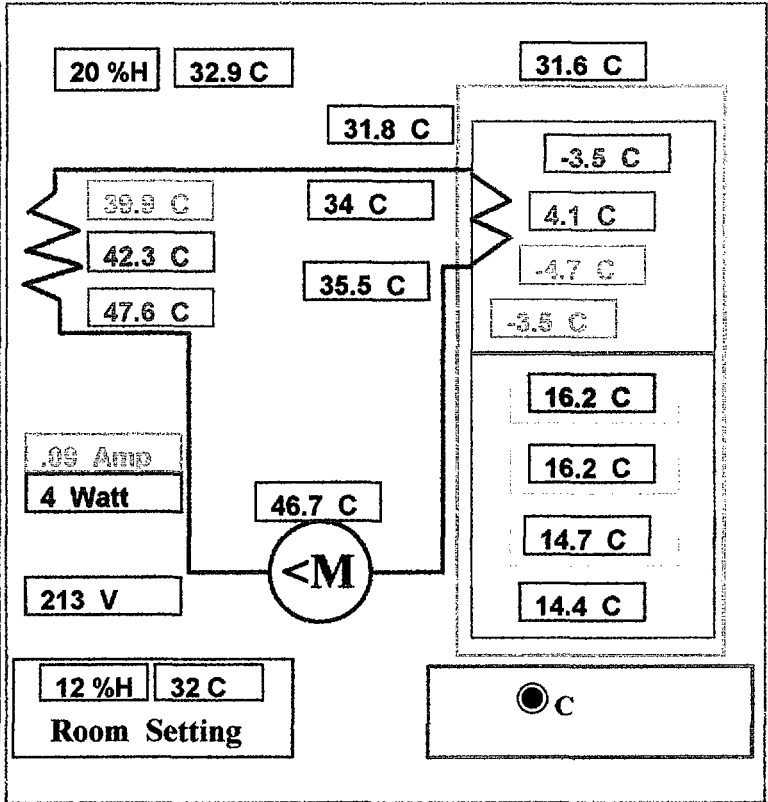
Report No.: () - Page 1

PageTestName: Energy Consumption

ReportDate: 78/08/17 17:47

Page Result :

1 - Page Test Time	1 Hours
2 - Working Percent	42 %On
3 - Energy (Accord to page)	1.519 kwh
4 - Zoom Time	2:49 Hour
5 - Compr Current	0.09 Amp
6 - Evaprator Mean Temp	-1.9 C
7 - Cabin Mean Temp	15.7 C
8 - Crisp Temp	14.4 C
9 - Compr Temp	46.7 C
10- Condensor In Temp	47.6 C
11- Condensor Out Temp	39.9 C
12- Condition	32.9 C 20 %H
13- Volt	Max=213 Mean=213 Min=203
14-	
15-	
16-	
17-	



Industrial Control Research Center HotRoom Ver 5

