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REPORT

CONVERSION OF

Movalled Co.

HOT CHAMBER

FINAL   REPORT

Contract No. 98/165P

UNIDO's PROJECT No. MP/IRA/96/041

15 Apr. 2000

OFFICE :   No. 201
            Mahestan Bld.
            Enghelab Sqr.
            TEHRAN IRAN
            Tel. 00 98 21 6432854
            Fax   00 98 21 6420759

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OFFICE :	No. 201
	Mahestan Bld.
	Enghelab Sqr.
	TEHRAN IRAN
	Tel. 00 98 21 6432854
	Fax 00 98 21 6420759

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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/96/041** 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.

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

OFFICE :   No. 201
           Mahestan Bld.
           Enghelab Sqr.
           TEHRAN IRAN
           Tel.   00 98 21 6432854
           Fax   00 98 21 6420759

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INTRODUCTION

According to **UNIDO** contract No. **99/132P** with Industrial Control Research Center Co. **(ICRC)** the existing *Movalled 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**.

OFFICE : No. 201
Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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2 The **CFC** phase out project in *Movalled Co.* will enable *Movalled 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 *Movalled Co.* is to perform all required check and tests, suitable for Refrigerator & Freezers using Ozone Friendly Gases. The existing test facilities in *Movalled 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.

OFFICE : No. 201
Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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ICRC Hot Chamber Characteristics

In order to convert *Movalled 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 *Movalled Co.* is being converted and equipped in such a way to enable *Movalled 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

OFFICE :   No. 201
           Mahestan Bld.
           Enghelab Sqr.
           TEHRAN IRAN
           Tel. 00 98 21 6432854
           Fax   00 98 21 6420759

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MOVALLED
HOT CHAMBER
TECHNICAL SPECIFICATION

As previously mentioned , *Movalled Co.*'s   plant is producing 200 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

OFFICE :   No. 201
            Mahestan Bld.
            Enghelab Sqr.
            TEHRAN IRAN
            Tel. 00 98 21 6432854
            Fax   00 98 21 6420759

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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.

OFFICE : No. 201
Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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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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Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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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.

OFFICE : No. 201
Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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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.

OFFICE :   No. 201
            Mahestan Bld.
            Enghelab Sqr.
            TEHRAN IRAN
            Tel. 00 98 21 6432854
            Fax   00 98 21 6420759

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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.

OFFICE : No. 201
Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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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 *Movalled Co.* engineers and hot chamber in order to coordinate activities.
-Advising for the necessary modification on the Room .

20/2 :

-VISITING PLANT 2 DAYS , 2 ENGINEER AND 1 TECHNICIAN, THREE TIMES.
-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

OFFICE : No. 201
Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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-Visiting and coordinating with **UNDP office** .
-Technical negotiation with *Movalled 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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Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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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

OFFICE : No. 201
          Mahestan Bld.
          Enghelab Sqr.
          TEHRAN IRAN
          Tel. 00 98 21 6432854
          Fax   00 98 21 6420759

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```
Dim Black, Blue, Green
Dim Cyan, red, Magenta, YELLOW
Dim gray, L_Blue, L_Green
Dim L_cyan, L_red, L_Magenta, L_yellow

Dim prn_color As Integer 'False=Black & White ; True=Color

Dim printcolor As Integer
Dim Y, Repstr$, Rot_Txt_no%
Dim printerdrawwidth As Integer
Dim offset, PageNo
Dim Lb_Tmp As Label
Dim FirstKey

Dim Rec_Max%
Dim SegEn
Dim ActiveFrame    As Integer
Dim ActiveLabel    As Integer
Dim Seg_n          As Integer

Dim PrnPageNo      As Integer
Dim ActivePage     As Integer


Dim sl%, st%, sw%, sh%, dw%
Dim a30 As String * 30

Dim rr() 'Extracted Results
```

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Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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'

Sub cmd_click (Index As Integer)

```
    Select Case Index
        Case 0                  'print
            screen.MousePointer = 11
            Cmd(0).Enabled = False
            Cmd(1).Enabled = False
            DoEvents
            Call Print_All
            Call Save_Spec
            screen.MousePointer = 0
            Cmd(0).Enabled = True
            Cmd(1).Enabled = True
            'Unload Me

        Case 1                  'Save
            nn = Variable("Prnt", "Write")
            nn = Variable("Prnt", "Read")
        Case 2                  'cancel
            Unload Me
        Case 3
            Me.Hide
            Paper.Show
    End Select
    Exit Sub
End Sub
```

OFFICE :   No. 201
            Mahestan Bld.
            Enghelab Sqr.
            TEHRAN IRAN
            Tel. 00 98 21 6432854
            Fax   00 98 21 6420759

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```
Sub Color_chk_Click (Value As Integer)

' If color_chk.Value = False Then
'     prn_color = False
'     color = 0
'     Black = color
'     Blue = color
'     Green = color
'     Cyan = color
'     red = color
'     Magenta = color
'     YELLOW = color
'     gray = color
'     L_Blue = color
'     L_Green = color
'     L_cyan = color
'     L_red = color
'     L_Magenta = color
'     L_yellow = color
'
' Else
      prn_color = True
      Black = QBColor(0)
      Blue = QBColor(1)
      Green = QBColor(2)
      Cyan = QBColor(3)
      red = QBColor(4)
      Magenta = QBColor(5)
      YELLOW = QBColor(6)
      gray = QBColor(8)
      L_Blue = QBColor(9)
      L_Green = QBColor(10)
      L_cyan = QBColor(11)
      L_red = QBColor(12)
      L_Magenta = QBColor(13)
      L_yellow = QBColor(14)
' End If
```

OFFICE : No. 201
Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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End Sub

Sub crv (mode$, Rec1, Rec2)

```
 Select Case mode$
   Case "prn"
     printer.ForeColor = Black
     printer.FontName = "Arial"
     printer.FontSize = 10
     obj = ActiveObj

     'print x_axis
     printer.DrawWidth = 3 * printerdrawwidth
     printer.Line (Rec1, 0)-(Rec2, 0)'axis
     printer.DrawWidth = 1
     printer.DrawStyle = 2'=DOt 3=Dash-Dot 4=Dash_Dot_Dot
     For i = -300 To 1000 Step 100
        printer.Line (Rec1, i)-(Rec2, i)
     Next i
     rec = zoom(Seg_n).X1
     printer.DrawWidth = 3 * printerdrawwidth
     printer.ForeColor = IIf(prn_color = False, Black, zoom(Seg_n).BorderColor)
     printer.Line (rec, -300)-(rec, 1000)
     printer.DrawStyle = 0 'Solid
     printer.DrawWidth = 1 * printerdrawwidth

     printer.CurrentX = rec - RecLb(Seg_n).Width / 2
     printer.CurrentY = 1030
     printer.Print RecLb(Seg_n).Caption

     n = -1
     R1 = (Rec1 \ 10 + 1) * 10
     R2 = (Rec2 \ 10) * 10
     printer.FontSize = 5
```

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Mahestan Bld.
Enghelab Sqr.
TEHRAN IRAN
Tel. 00 98 21 6432854
Fax 00 98 21 6420759

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```
printer.Line (rec, 10)-(rec, -10), Black
    n = n + 1
    If n Mod 3 = 0 Then
        b$ = Right$("0" & rec \ 60, 2) & ":" & Right$("0" & rec Mod 60, 2)
        printer.CurrentX = rec - 2'offset / 13
        printer.CurrentY = -12
        printer.Print b$
    End If
Next rec

'graph
For n = 0 To 1
    For d = 1 To 6
        If curve_Item(n, d) < 50 Then
            z = curve_Item(n, d)
            If curve_color(n, d) = 15 Then col = 0 Else col = curve_color(n, d)
            printer.ForeColor = IIf(prn_color = False, Black, QBColor(col))
            For rec = Rec1 To Rec2 - 1
                bool1 = grf(26, rec) = 789
                bool2 = grf(26, rec + 1) = 789
                If bool1 And bool2 Then
                    Y1 = grf(z, rec)
                    Y2 = grf(z, rec + 1)
                    printer.Line (rec, Y1)-(rec + 1, Y2)
                End If
            Next rec
        End If
    Next d
Next n
Case "grfall"
    On Error Resume Next 'Note:Karim
    obj = ActiveObj
    grafall.Cls
    grafall.DrawMode = 7               '(7=xor 13=copy)
    RecAll_End = UBound(grf, 2)
    If Err = 9 Then
```

Hot Chamber
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