```
Program Heatpumpcanrun;
Uses wincrt,winprocs,windos;
************************************************************
program make to :wa,mf,time q,sec
        input: ta, rha,mp,md,min ,ca ,cv ,hfg ,tdi,rc,bp
        output: wa,mf,time,q,sec
************************************************************
Type
   ResultRecord = Record
                Mp: Integer;
                ta:  Real;
                rha: Real;
                tmix:Real;
                tco:Real;
                tdi: Real;
                md : Real;
                Rc : Real;
                Bp : Real;
                Sec: real;
                secp:real;
                Comment: Char;
              End;
   ArrayResult = Array [1..200] of ResultRecord;
const
  days : array [0..6] of String[9] =
('Sunday','Monday','Tuesday','Wednesday','Thursday','Friday',
            'Saturday');
Var
       year, month, date, dow : Word;
        h, m, se, hund : Word;
        fileVar : text;
        filename : string[20];
        Result : ArrayResult;
        count:Longint;
```

```
        loop:integer;
        test,S,mp:integer;
        Mdesign,hfg,Min,pa,ca,cv,Pva,Pvsa,RHa,Ta,Wa,XX,Pvdo,Tdocon:Real;
        dt,tdi,t,Mi,X1,X2,wdi,wdo,tdo,RHdi,Pvdi,Pvsdi:Real;
        md,Meq,Mf,Tmix,Wmix,wdn,Rc,Sec,qsum,Qh,secp,sect:real;
        CheckMf,Checktco,CheckT,CheckR,CheckWdo,CheckTdo:Boolean;
        Comment:Char;
        {new var_bp}
        bp,x3,pvscon,rhcon,tcon,ml,bf,ter,tcr,hcr,hgc,hfc,teo,pv,wcon,weo
        ,hge,Hd1,FreeS2,FreeD2,pcsum,pvcon,wmix1,hlc,tmix1,Qc,qe,tco,pc,pcs:real;
Procedure  SetVariable_start;
            Begin
              S:=1;
              ca:=1.008;
              cv:= 1.88;
              hfg :=2500;
              pa := 101.325;
              Min := 3;
              dt := 0.01;
              Mdesign :=0.25;
              mi:= min;
              wdo:=0.0290;
              t:=0;
              sec:=0;
              CheckWdo:= False;
              Checktco:=False;
              CheckTdo:=False;
              CheckT:=False;
              CheckR:=False;
              CheckMf:=False;
              Qe:=0;
              Qc:=0;
              Qsum:=0;
              Pcsum:=0;
```

```
            tmix:=0;
            tmix1:=0;
            wmix:=0;
            wmix1:=0;
          End;
*************************************************************
   Function FindQe
          input :
          Output : wdi
*************************************************************
Procedure FindQe_Qc_Pc ;
        Begin
          X3:=tdo+273.15;         {Tdo = Degree C}
          Pvcon:=101.325*wdo/(0.62189+wdo);
          Pvscon:=exp((-7511.52/X3)+89.6312+(2.39989E-02*X3)-(1.165455e-5*X3*X3)
                  -(1.2810336E-8*X3*X3*X3) +(2.09984E-11*X3*X3*X3*X3)-
(12.1507899*LN(X3)));
          Rhcon:= Pvcon/Pvscon;
          if Rhcon>1 then
            Rhcon:= 0.99;
          Tcon:=6.938+14.38*Ln(rhcon*pvscon)+1.079*(ln(rhcon*pvscon))*(ln
(rhcon*pvscon));
{Cr=4,r-12}
          Ter:=Tcon;
          Tcr:=-4e-05*ter*ter*ter+9e-4*ter*ter+1.4188*ter+49.836;
          FreeS2:=-2e-09*Ter*Ter*Ter*Ter+2e-07*Ter*Ter*Ter+5e-07*Ter*Ter-6e-
4*Ter+1.5602;
          FreeD2:=-2e-09*Tcr*Tcr*Tcr*Tcr+2e-07*Tcr*Tcr*Tcr+5e-07*Tcr*Tcr-6e-
04*Tcr+1.5602;
          Ter:=ter+273.15;
          Tcr:=tcr+273.15;
          Hd1:= Hgc+(FreeS2-FreeD2)*Tcr;              {Tcr =  Kelvin}
          Hge:=355.19+0.378*(ter-273.15);
          Hfc:=199.79+1.020*(tcr-273.15);
```

```
            Hgc:=355.19+0.378*(tcr-273.15);
            Qe:=0.095*(Hge-Hfc);                          { KW ,ml=0.095}
            Qc:=0.095*(Hd1-Hfc);
 Teo:=0.2*tdo*(ca+cv*wdo)+0.8*tcon*(ca+cv*wcon))/(ca+0.8*cv*wcon+0.2*cv*wdo);
                                                                {BF=0.2}
           { Pv:=5.4867-101.325*6.66e-4*(tcon-34.57);   }
            Wcon:=0.62197*pvcon/(101.325-pvcon);
            Weo:=0.8*Wcon+0.2*Wdo;
            Wmix1:=(1-BP)*weo+BP*wdo;
            Tmix1:=((1-BP)*(ca*teo+weo*(hfg+cv*teo))+BP*(ca*tdo+wdo*(hfg+cv*tdo))
                     -wmix1*hfg)/(ca+wmix1*cv);
            Pc:=Qc-Qe;                          {Pc= Kw}
            Pcsum:=Pcsum+Pc*dt*3600;                {Pcsum = Kj , dt= hour}
         End{End FindQe_Qc_Pc};
*********************************************************************
   Procedure FindWa
          Input: ta ,rha
          Output:Wa
*************************************************}
Procedure  FindWa;
          Begin
              XX:=Ta+273.15;
              Pvsa:=exp(-7511.52/XX+89.6312+2.39989E-02*XX-1.165455e-5*XX*XX
                       -1.2810336E-8*XX*XX*XX+2.09984E-11*XX*XX*XX*XX-12.1507899*LN
(XX));
              Pva:= RHa/100*Pvsa;
              Wa:= (0.62189*Pva)/(Pa-Pva);
          End{End FineWa};
*************************************************************
    Function Findwmix
           input : wa,wdo,rc
           Output : wdi
*************************************************************
Procedure FindWmix;
```

```
        Begin
            Wmix := (1-RC)*wa+RC*wmix1;
        End{End FindWdi};
*****************************************************************
   Function FidTdo
        input: tdi ,ca,wdi,cv,hfg,wdo
        Output :tdo
 *****************************************************************
 Procedure FindTdo;
            Begin
            Tdo:=(tdi*ca+tdi*wdi*cv+hfg*wdi-hfg*wdo)/(ca+wdo*cv);
            Pvdo := 101.325*wdo/(0.62189+wdo);
            Tdocon:= 6.983+14.38*ln(Pvdo)+1.079*ln(Pvdo)*ln(Pvdo);
End{End findTdo};
*****************************************************************
  Function FindRhdi
        input: wdi,tdi,tdo,wdo
        Output :Rhdi
*****************************************************************
Procedure FindRhdi;
        Var
          Pvdi,TestRhdi,Pvsdi:real ;
        Begin
            Pvdi:=101.325*((wdi+wdo)/2)/(0.62189+(wdi+wdo)/2);
            X1:=((Tdi+tdo)/2+273);
          Pvsdi:=exp((-7511.52/X1)+89.6312+(2.39989E-02*X1)-(1.165455e-5*X1*X1)-
                    (1.2810336E-8*X1*X1*X1)  +(2.09984E-11*X1*X1*X1*X1)-(12.1507899*LN
(X1)));
            Rhdi:= Pvdi/Pvsdi;
End{End FindRhdi};
 *****************************************************************
 Function FindMeq
        input: X1,X2,Rhdi
        Output :Meq
```

```
************************************************************
Procedure FindMeq;
        Var
          A,B:Real;
        Begin
          A:=2.3015 - 0.00615*X1;
          B:=-1.3453+0.00507*X1;
          X2:=RHdi/(1-RHdi);
           Meq:=exp(ln(A)+B*ln(X2))
        End{End FindMeq};
************************************************************
Function FindMf
        input: Tdi,Min,Meq,dt,t
        Output : Mf
************************************************************
Procedure FindMf;
        Var
          K:real;
        Begin
           k:=-5e-5*Tdi*Tdi+0.0082*Tdi-0.2692;
           Mf:=Mi-(Min-Meq)*dt*k*exp(-k*t);
        End{End FindMf};
************************************************************
Function FindWdn
        input: mp,mi,mf,dt,md,wdi
        Output : Wdn
************************************************************
Procedure FindWdn;
        Begin
          Wdn:= mp*(Mi-Mf)/(dt*md)+Wdi;
        End{End FindWdn};
************************************************************
Function Compare Wdn_With_Wdo
        Input: wdn,wdo
```

```
        Output: True,False
*************************************************************
Function Compare_Wdn_Wdo(Var Wdo,Wdn : Real):Boolean;
        Begin
            if (Abs(wdn-wdo)<0.0001) then
                Begin
                Compare_Wdn_Wdo:= True;
                wdo := Wdn;
                End
            else
                Begin
                Compare_Wdn_Wdo:=False;
                wdo := (wdn+wdo)/2;
                End;
        End{End Compare_wdo_wdn};
*************************************************************
 Function FindTmix
        input: rc,ca,ta,wa,hfg,cv,tdo,wdn
        Output : Tmix
*************************************************************
Procedure FindTmix;
        Begin
           Tmix:= ((1-RC)*(ca*ta+wa*(hfg+cv*ta))+rc*(ca*tmix1+wmix1*(hfg+cv*tmix1))-
                    wmix*hfg)/(ca+cv*wmix);
        End{End FindTmix};
*************************************************************
procedure FindTco
         input: tmix,Qc,wmix
         output: tco
*************************************************************
Procedure FindTco;
        begin
            Tco:=tmix+(Qc*3600)/(md*(ca+wmix*cv));
        end;
```

```
*************************************************************
 Function FindSec
        input: qsum,mp,tdi,tmix,md,ca,wdi,cv,dt
        Output : Sec
*************************************************************
Procedure FindSec;
        Begin
        if tco<tdi then
            Qh:= (Tdi-Tco)*md*(ca+Wdi*cv)*dt         {Qh =Kj}
        else
            Qh:=0;
        Qsum:= Qsum+Qh;
        Sec:= Qsum/(2.75*mp);                        {Sec = Kj/Kg Water remove}
        secp:= pcsum/(2.75*mp);
        sect:=sec+secp;
        End{End FindSec};
*************************************************************
 Function Compare Mf_Mdesign
        Input: Mf,Mdesign
        Output: True,False
*************************************************************
Function Compare_Mf_Mdesign(Var Mf,Mdesign : Real):Boolean;
        var test:real;
        Begin
           if Mf<Mdesign then    { Mf<0.25 ---> Stop }
           Compare_Mf_Mdesign:= True
           else
             Begin
                Compare_Mf_Mdesign:= False;
                t:=dt+t;
                mi:=mf
             End
        End{End Compare_Mf_Mdesign};
*************************************************************************
```

```
  procedure Call fucntion all
*******************************************************************************
Procedure CallAll;
            Begin
           FindWa;
          Repeat
              IF s=1 then                          {if start process}
                Begin
                  s:=2;
                  Repeat
                       FindQe_Qc_Pc;
                       FindWmix;                        {call FindWdi function}
                       wdi:=wmix;
                       FindRhdi;                       {call FindRhdi function}
                        if Rhdi< 0.95 Then
                        begin
                         FindMeq;                        {call findMeq function}
                         FindMf;                        {call FindMf fucntion}
                         FindWdn;                         {call FindWdn function}
                         FindTdo;
                         FindTmix;                        {call FindTmix Function}
                        end
                        else
                        Rhdi:=1;
                        begin
                         FindMeq;                        {call findMeq function}
                         FindMf;                        {call FindMf fucntion}
                         FindWdn;                         {call FindWdn function}
                         FindTdo;
                         FindTmix;                        {call FindTmix Function}
                        end;
                       Checkwdo:= Compare_Wdn_Wdo( Wdo,Wdn);
                  Until (Checkwdo );              {check Wdn with Wdo}
                  if Rhdi<0.99 then
```

```
        begin
          FindQe_Qc_Pc;
          FindWmix;                          {call FindWdi function}
          wdi:=wmix;
          FindMeq;                           {call findMeq function}
          FindMf;                            {call FindMf fucntion}
          FindWdn;
          wdo:=wdn;                          {call FindWdn function}
          FindTdo;
          FindTmix;
          Findtco;
          FindSec;                                  {call FindSec funtion}
          if tco > tdi then
           begin
          checktco:= True;
            comment:='t';
           End  ;
          checkMf:= Compare_Mf_Mdesign(Mf,Mdesign);
        end
      End
    Else
      Begin
        FindQe_Qc_Pc;
        FindWmix;                                   {call FindWdi function}
        wdi:=wmix;
        FindRhdi;                                  {call FindRhdi function}
        If Rhdi<0.99 then
          Begin
          FindMeq;                                  {call findMeq function}
          FindMf;                                  {call FindMf fucntion}
          FindWdn;                                  {call FindWdn function}
          wdo:=wdn;
          FindTdo;
          if ((Tdo>tdi)or (Tdo < Tdocon))Then
```

```
    begin
        CheckTdo := True;
        Comment:= 'D' ;
    end
  else
    begin
        FindTmix;                                {call FindTmix Function}
        Findtco;
        FindSec ;
        if tco > tdi then
          begin
              checktco:= True;
              comment:='t';
          end
        else
              checkMf:= Compare_Mf_Mdesign(Mf,Mdesign);
    end
  End
Else
Rhdi:=1;
Begin
  FindMeq;                                  {call findMeq function}
  FindMf;                                  {call FindMf fucntion}
  FindWdn;                                  {call FindWdn function}
  wdo:=wdn;
  FindTdo;
  if ((Tdo>tdi)or (Tdo < Tdocon))Then
    begin
        CheckTdo := True;
        Comment:= 'D' ;
    end
  else
    begin
        FindTmix;                                {call FindTmix Function}
```

```
                    Findtco;
                    FindSec ;
                    if tco > tdi then
                      begin
                          checktco:= True;
                          comment:='t';
                      end
                    else
                   checkMf:= Compare_Mf_Mdesign(Mf,Mdesign);
                 end
               End
               Begin
               checkR:=True;
               Comment:='R';
               End}
           End ;
       if t>50 then
        begin
           Comment:='T';
           CheckT:=True;
        end;
    Until ( CheckMf or checktco or checkT or CheckTdo);     {copare Mf Mdesign}
       if  Compare_Mf_Mdesign(Mf,Mdesign) Then
       Comment:='M';
    count:=count+1;
    write(' ',count);
 End{End CallAll};
*****************************************************************************
  Procedure MinSix fucntion all
*****************************************************************************
Procedure MinSix(Var loop:integer);
        Begin
        if ((Sec > 0 ) and (Comment ='M')) then
           Begin
```

```
    {Compare Value Sec}
If( Loop>=1 ) and (Result[loop].tco <= Result[loop].tdi) then
  Begin
    if(( sec< Result[1].sec)  or ( Result[1].sec = 0 )) then
      begin
        Result[6]:=Result[5];
        Result[5]:=Result[4];
        Result[4]:=Result[3];
        Result[3]:=Result[2];
        Result[2]:=Result[1];
        Result[1].mp := mp;
        Result[1].ta:= ta;
        Result[1].rha:= rha;
        Result[1].tdi:= tdi;
        Result[1].tco:=tco;
        Result[1].tmix:= tmix;
        Result[1].secp:= secp;
        Result[1].md:= md;
        Result[1].rc:= rc;
        Result[1].bp:= bp;
        Result[1].Sec:= Sec;
        Result[1].Comment:= Comment;
      end
    else
      if(( sec< Result[2].sec) or( Result[2].sec = 0 ))then
        begin
          Result[6]:=Result[5];
          Result[5]:=Result[4];
          Result[4]:=Result[3];
          Result[3]:=Result[2];
          Result[2].mp := mp;
          Result[2].ta:= ta;
          Result[2].rha:= rha;
          Result[2].tdi:= tdi;
```

```
        Result[2].tco:=tco;
        Result[2].tmix:= tmix;
        Result[2].secp:= secp;
        Result[2].md:= md;
        Result[2].rc:= rc;
        Result[2].bp:= bp;
        Result[2].Sec:= Sec;
        Result[2].Comment:= Comment;
      end
  else
     if ((sec< Result[3].sec)or( Result[3].sec = 0 )) then
        begin
          Result[6]:=Result[5];
          Result[5]:=Result[4];
          Result[4]:=Result[3];
          Result[3].mp := mp;
          Result[3].ta:= ta;
          Result[3].rha:= rha;
          Result[3].tdi:= tdi;
          Result[3].tco:=tco;
          Result[3].tmix:= tmix;
          Result[3].secp:= secp;
          Result[3].md:= md;
          Result[3].rc:= rc;
          Result[3].bp:= bp;
          Result[3].Sec:= Sec;
          Result[3].Comment:= Comment;
        end
     else
        if ((sec< Result[4].sec) or( Result[4].sec = 0 )) then
           begin
             Result[6]:=Result[5];
             Result[5]:=Result[4];
             Result[4].mp := mp;
```

```
    Result[4].ta:= ta;
    Result[4].rha:= rha;
    Result[4].tdi:= tdi;
    Result[4].tco:=tco;
    Result[4].tmix:= tmix;
    Result[4].secp:= secp;
    Result[4].md:= md;
    Result[4].rc:= rc;
    Result[4].bp:= bp;
    Result[4].Sec:= Sec;
    Result[4].Comment:= Comment;
  end
 else
  if ((sec< Result[5].sec)or( Result[5].sec = 0 )) then
     begin
       Result[6]:=Result[5];
       Result[5].mp := mp;
       Result[5].ta:= ta;
       Result[5].rha:= rha;
       Result[5].tdi:= tdi;
       Result[5].tco:=tco;
       Result[5].tmix:= tmix;
       Result[5].secp:= secp;
       Result[5].md:= md;
       Result[5].rc:= rc;
       Result[5].bp:= bp;
       Result[5].Sec:= Sec;
       Result[5].Comment:= Comment;
     end
  else
     if(( sec< Result[6].sec )or( Result[6].sec = 0 )) then
       begin
         Result[6].mp := mp;
         Result[6].ta:= ta;
```

```
                    Result[6].rha:= rha;
                    Result[6].tdi:= tdi;
                    Result[6].tco:=tco;
                    Result[6].tmix:= tmix;
                    Result[6].secp:= secp;
                    Result[6].md:= md;
                    Result[6].rc:= rc;
                    Result[6].bp:= bp;
                    Result[6].Sec:= Sec;
                    Result[6].Comment:= Comment;
                  end
              End{End if <1 loop}
              else
               if  (Result[loop].tco <= Result[loop].tdi) then
               begin
                  Result[1].mp := mp;
                  Result[1].ta:= ta;
                  Result[1].rha:= rha;
                  Result[1].tdi:= tdi;
                  Result[1].tco:=tco;
                  Result[1].tmix:= tmix;
                  Result[1].secp:= secp;
                  Result[1].md:= md;
                  Result[1].rc:= rc;
                  Result[1].bp:= bp;
                  Result[1].Sec:= Sec;
                  Result[1].Comment:= Comment;
               end
          End{sec>10} ;
     End{End MinSix};
**********************************************************************
  Procedure ChangeMp
     :procedure make to change Mp Value (30 ,60 , 90,...)
**********************************************************************
```

```
Procedure ChangeMp;
        Begin
            ta:=28;
            Repeat
               rha:=70;
               Repeat
                  tdi:=75;
                  Repeat
                     md:= 400;
                     Repeat
                        rc:=0.20;
                        Repeat
                           bp:=0.0;
                           Repeat
                              loop :=10;
                              CallAll;
                              Result[loop].tco:=tco;
                              Result[loop].tdi:=tdi;
                              Result[loop].sec:=sec;
                              MinSix(loop);
                              bp:=bp+0.1;
                              SetVariable_start;
                           Until(bp>0.90);
                           rc:=rc+0.06;
                        Until(rc>0.90);
                        md:=md+50;
                     Until(Md>650);
                     tdi:=tdi+10;
                  Until(tdi>70);
                  rha:= rha+5;
               Until(Rha>70);
               ta:=ta+5;
            Until(ta>30);
        End{End ChangeMp};
```

```
function LeadingZero(w : Word) : String;
 var
   s : String;
 begin
   Str(w:0,s);
   if Length(s) = 1 then
     s := '0' + s;
   LeadingZero := s;
 end;
     {.....Start Main .....}
BEGIN
filename:='Md1820';
     assign(fileVar,filename) ;
     rewrite(fileVar);
     GetDate(year,month,date,dow);
     Writeln(filevar,'Today is.... ', days[dow],', ',
          date:0, '/', month:0, '/', year:0);
     GetTime(h,m,se,hund);
     writeln(filevar,'Start program at time
:',LeadingZero(h),':',LeadingZero(m),':',LeadingZero(se),'.',LeadingZero(hund));
     close(filevar);
     SetVariable_start;
     Writeln(' - - - The Program HeatPump - - -');
     Writeln('       - - Please  Wait - -') ;
     write('  ');
     mp:=30;
     ChangeMp;
  writeln;
  Writeln('-------------------------------------------------------------------------------');
  Writeln('| No|  Mp  |   md   |   Ta  |   Rha  | Tmix | t  | Tdi  |   Rc  |  Bp  |    Sec'
       ,'      |  Secp | sect |  Comment|');
  Writeln('-------------------------------------------------------------------------------');
       for test := 1 to 6 do
          begin
```

```
            With Result[test] do
            begin
writeln(test:3,mp:9,md:9:0,ta:9:0,rha:9:0,Tmix:9:0,tco:9:0,tdi:9:0,rc:9:2,bp:9:2,sec:10:2,
              Secp:9:2,'',Comment:5)
            end;
          end;
   GetTime(h,m,se,hund);
   Writeln('It is now ',LeadingZero(h),':',
           LeadingZero(m),':',LeadingZero(se),
           '.',LeadingZero(hund));
  writeln('.....Please Enter for Write to File.....');readln;
  assign(fileVar,filename) ;
  append(fileVar);
      Writeln(fileVar,'-------------------------------------------------------------------------------');
      Writeln(fileVar,'| No|  Mp  |   md   |    Ta   |   Rha  | Tmix | t | Tco   | Tdi |    Rc  |  Bp  |
Sec'
                              ,'       |  Secp  |sect   | Comment|');
      Writeln(fileVar,'-------------------------------------------------------------------------------');
       for test := 1 to 6 do
          begin
            With Result[test] do
            begin
  riteln(fileVar,test:3,mp:9,md:9:0,ta:9:0,rha:9:0,t:9:0,tco:9:0,tdi:9:0,rc:9:2,bp:9:2,sec:10:2,
              Secp:9:2,Sect:9:2,'',Comment:5)
            end;
          end;
 GetTime(h,m,se,hund);
 writeln(filevar);
 writeln(filevar,'End of program at time
:',LeadingZero(h),':',LeadingZero(m),':',LeadingZero(se),'.',LeadingZero(hund));
 close(filevar);
 writeln('          Good  bye _ _ HeatPump');
END.
```