ภาคผนวก ฉ

โปรแกรม MATLAB ที่ใช้ในการเก็บข้อมูลและคำนวณค่าต่างๆ

```
for i = 1:1000000
load Test1.dat -ascii
B = Test1

%DATA REDUCTION PROGRAME FOR HEAT PIPE DEHUMIDITY
%TEST
Ts  =   B(:,1);

V2  =   B(:,2);    % Volt Temp AIR Ent. Heatpipe
V3  =   B(:,4);    % Volt RH Ent. Heatpipe

V4  =   B(:,6);    % Volt TempAIR Leav. HP_reheat
V5  =   B(:,8);    % Volt RH AIR Leav. HP_reheat

V6  =   B(:,10);   % Volt Temp AIR Ent. Condenser
V7  =   B(:,12);   % Volt RH AIR Ent. Condenser

V8  =   B(:,14);   % Volt Temp AIR Leav. Condenser
V9  =   B(:,16);   % Volt RH AIR Leav. Condenser

%KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK
KKKKKKKKKKKK
T5   =   B(:,18);   % Temp Surface inlet Evaporator
T6   =   B(:,20);   % Temp Surface outlet Evaporato
T7   =   B(:,22);   % Temp Surface inlet Condenser
T8   =   B(:,24);   % Temp Surface outlet Condenser

%KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK
KKKKKKKKKKKKK
T9  =   B(:,26) ;    % Temp AIR Ent. Evaporator
T10 =   B(:,28) ;    % Temp AIR Out. Evaporator
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T11 =   B(:,30) ;    % Temp AIR Out. Heatpipe reheat
T12 =   B(:,32) ;    % Temp AIR Ent. Condensor
T13 =   B(:,34) ;    % Temp AIR Out. Condensor
T14 =   B(:,36) ;    % Temp Water Condensate

%KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK
KKKKKKKKKKKK
T15 =   B(:,38) ;   %Temp Surface Evaporator Heat pipe
T16 =   B(:,40) ;   %Temp Surface Evaporator Heat pipe
T17 =   B(:,42) ;   %Temp Surface Adiabatic Heat pipe
T18 =   B(:,44) ;   %Temp Surface Adiabatic Heat pipe
T19 =   B(:,46) ;   %Temp Surface Condenser Heat pipe
T20 =   B(:,48) ;   %Temp Surface Condenser Heat pipe
T21 =   B(:,50) ;   %Temp Surface Adiabatic Heat pipe
T22 =   B(:,52) ;   %Temp Surface Adiabatic Heat pipe

%KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK
KKKKKKKKKKKKKKKKKKKK
T1  = V2.*10-40  ;  % Temp AIR Ent. Heatpipe
T2  = V4.*10-40  ;  % TempAIR Leav. HP_reheat
T3  = V6.*10-40  ;  % Temp AIR Ent. Condenser
T4  = V8.*10-40  ;  % Temp AIR Leav. Condenser

%KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK
KKKKKKKKKKKKKKKKKKKK
RH1 =   V3./10   ;  %humidity AIR Ent. Heatpipe
RH2 =   V5./10   ;  %humidity AIR Leav. HP_reheat
RH3 =   V7./10   ;  %humidity AIR Ent. Condenser
RH4 =   V9./10   ;  %humidity AIR Leav. Condenser

%KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK
KKKKKKKKKKKKKKKKKKKK
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```
Time=   Ts/6;

%-----------------------------------------------------------------------
%Area dust
A_1  =  0.3627; %m^2 Air inlet
A_2  =  0.3627 ; %m^2 Air outlet

%Hydraulic diamrter(Dh)
Dh_1 = 0.6020  ; %m
Dh_2 = 0.6020  ; %m

%Air velocity
Velo_1 =   2.15 ; %m/s  Air inlet
Velo_2 =   2.15 ; %m/s  Air outlet

%Volume Flow rate
Vflow_1 = Velo_1*A_1 ; %m3/s Air Flow inlet
Vflow_2 = Velo_2*A_2 ; %m3/s Air Flow outlet

%CFM
CFM_1  = 60*35.315*Vflow_1 ; %CFM Air inlet Flow
CFM_2  = 60*35.315*Vflow_2 ; %CFM Air outlet Flow

%Air density
rho_EntHeatpipe_precool  =  4.481185-0.02113391*(T1+273.15)+0.0000437296*(T1+273.15).^2-
0.00000003252345*(T1+273.15).^3-0.000000000002356712*(T1+273.15).^4; %kg/m^3
rho_OutHeatpipe_precool  =  4.481185-0.02113391*(T9+273.15)+0.0000437296*(T9+273.15).^2-
0.00000003252345*(T9+273.15).^3-0.000000000002356712*(T9+273.15).^4; %kg/m^3
rho_OutEvaporator        =  4.481185-0.02113391*(T10+273.15)+0.0000437296*(T10+273.15).^2-
0.00000003252345*(T10+273.15).^3-0.000000000002356712*(T10+273.15).^4; %kg/m^3
```

```
rho_OutHeatpipe_reheat  =  4.481185-
0.02113391*(T11+273.15)+0.0000437296*(T11+273.15).^2-0.00000003252345*(T11+273.15).^3-
0.000000000002356712*(T11+273.15).^4; %kg/m^3
rho_EntCondenser      =  4.481185-0.02113391*(T12+273.15)+0.0000437296*(T12+273.15).^2-
0.00000003252345*(T12+273.15).^3-0.000000000002356712*(T12+273.15).^4; %kg/m^3
rho_OutCondenser      =  4.481185-0.02113391*(T13+273.15)+0.0000437296*(T13+273.15).^2-
0.00000003252345*(T13+273.15).^3-0.000000000002356712*(T13+273.15).^4; %kg/m^3

%Specific heat of Air
cp    =  1.005;   %kJ/kg.K

%Mass Flow rate
mass_flow_EntHeatpipe_precool  =  Vflow_1./rho_EntHeatpipe_precool   ; %kg/s
mass_flow_OutHeatpipe_precool  =  Vflow_1./rho_OutHeatpipe_precool   ; %kg/s
mass_flow_OutEvaporator        =  Vflow_2./rho_OutEvaporator        ; %kg/s
mass_flow_OutHeatpipe_reheat   =  Vflow_2./rho_OutHeatpipe_reheat    ; %kg/s
mass_flow_EntCondenser         =  Vflow_2./rho_EntCondenser         ; %kg/s
mass_flow_OutCondenser         =  Vflow_2./rho_OutCondenser         ; %kg/s

mass_av =
(mass_flow_EntHeatpipe_precool+mass_flow_OutHeatpipe_precool+mass_flow_OutEvaporator+
mass_flow_OutHeatpipe_reheat+mass_flow_EntCondenser+mass_flow_OutCondenser)./6 ;

%Pressure of dry air (Pg)
Pg1  = 0.0000009631.*T1.^4  -0.0000334367.*T1.^3  +0.0036110043.*T1.^2  +0.0161351776.*T1
+0.6731881560 ; %kPa
Pg9  = 0.0000009631.*T9.^4  -0.0000334367.*T9.^3  +0.0036110043.*T9.^2  +0.0161351776.*T9
+0.6731881560 ; %kPa
Pg10  = 0.0000009631.*T10.^4 -0.0000334367.*T10.^3 +0.0036110043.*T10.^2
+0.0161351776.*T10 +0.6731881560 ; %kPa
Pg11  = 0.0000009631.*T11.^4 -0.0000334367.*T11.^3 +0.0036110043.*T11.^2
+0.0161351776.*T11 +0.6731881560 ; %kPa
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Pg12  = 0.0000009631.*T12.^4 -0.0000334367.*T12.^3 +0.0036110043.*T12.^2
+0.0161351776.*T12 +0.6731881560 ; %kPa
Pg13  = 0.0000009631.*T13.^4 -0.0000334367.*T13.^3 +0.0036110043.*T13.^2
+0.0161351776.*T13 +0.6731881560 ; %kPa

%------------------------------------------------------------------------

%Differant Air Temperature
DT_preheat   =  (T1-T9);
DT_eva       =  (T9-T10);
DT_reheat    =  (T10-T11);
DT_cond      =  (T12-T13);

%Humidity
w1  =(0.622*RH1.*Pg1 )./(101.325-RH1.*Pg1 )   ; %kg water vapor/kg dry air
w2  =(0.622*RH2.*Pg11 )./(101.325-RH2.*Pg11 ) ; %kg water vapor/kg dry air
w3  =(0.622*RH3.*Pg12)./(101.325-RH3.*Pg12 ) ; %kg water vapor/kg dry air

RH9  = (w1.*101.325)./(Pg9.*(0.622+w1))      ; %RH
RH10 = (w2.*101.325)./(Pg10.*(0.622+w2))     ; %RH
RH13 = (w3.*101.325)./(Pg13.*(0.622+w3))     ; %RH

w4  =(0.622*RH13.*Pg13)./(101.325-RH13.*Pg13 )+0.0003 ; %kg water vapor/kg dry air

%h from air
h1  =1.005.*T1   +(w1.*  (2501+1.805.*T1  )) ; %kJ/kg
h2  =1.005.*T9   +(w1.*  (2501+1.805.*T9  )) ; %kJ/kg
h3  =1.005.*T10  +(w2.* (2501+1.805.*T10 )) ; %kJ/kg
h4  =1.005.*T11  +(w2.* (2501+1.805.*T11 )) ; %kJ/kg
h5  =1.009.*T12  +(w3.* (2501+1.805.*T12 )) ; %kJ/kg
h6  =1.009.*T13  +(w4.* (2501+1.805.*T13 )) ; %kJ/kg
```

```
% heat form h
Q_1    =   mass_flow_EntHeatpipe_precool.*(h1-h2)     ;   %kW
Q_2    =   mass_flow_OutHeatpipe_precool.*(h4-h3)  ;   %kW
Q_3    =   mass_flow_EntCondenser.*(h2-h3)   ;   %kW
Q_4    =   mass_flow_OutCondenser.*(h6-h5)   ;   %kW

%------------------------------------------------------------------------
%Graph
subplot(3,3,1)
plot(Time,T1,'--b',Time,T9,'--c',Time,T10,'--g',Time,T11,'--r',Time,T12,'--y',Time,T13,'--m')
h=legend('in evahp','in eva','out eva','out conhp','in con','out con',1);
title('Temperature Air at section');
xlabel('min')
ylabel('Temperature (^oC)')
grid on

subplot(3,3,2)
plot(Time,RH1.*100,Time,RH9.*100,'--y',Time,RH10.*100,'--b',Time,RH2.*100,'--
m',Time,RH3.*100,'--r',Time,RH13.*100,'--k')
h=legend('in evahp','in eva','out eva','out conhp','in con','out con');
title('Relative Humidity at section');
xlabel('min')
ylabel('%')
grid on

subplot(3,3,3)
plot(Time,T5,'--r',Time,T6,'--b',Time,T7,'--m',Time,T8,'--c')
h=legend('in eva','out eva','in cond','out cond',1);
title('Temperature surface coil');
xlabel('min')
ylabel('Temperature (^oC)')
grid on
```

```
subplot(3,3,4)
plot(Time,T15,'--b',Time,T16,'--m',Time,T17,'--r',Time,T18,'--k',Time,T19,'--g',Time,T20,'--
c',Time,T21,'--k',Time,T22,'--r')
h=legend('eva1','eva2','adia1','adia2','con1','con2','adia3','adia4',1);
title('Temp distribution of Heat pipe');
xlabel('min')
ylabel('Temperature (^oC)')
grid on

subplot(3,3,5)
plot(Time,Q_1,'--r',Time,Q_2,'--g',Time,Q_3,'--m',Time,Q_4,'--b')
h=legend('pre heatpipe','re heatpipe','eva','cond',1);
title('Heat Air distribution(cal from h ) ');
xlabel('min')
ylabel('kW')
grid on



subplot(3,3,6)
plot(Time,DT_preheat,'--m',Time,DT_eva,'--b',Time,DT_reheat,'--r',Time,DT_cond,'--g')
h=legend('DT preheat','DT eva','DT reheat','DT cond',1);
title(' Air Temperature different');
xlabel('min')
ylabel('Temperature different (^oC)')
grid on

subplot(3,3,7)
plot(Time,w1.*1000,'--m',Time,w2.*1000,'--b',Time,w3.*1000,'--g',Time,w4.*1000,'r')
h=legend('1','2','3','4',1);
title(' humidity');
xlabel('min')
```

```
ylabel('g water vapor/kg dry air')
grid on

subplot(3,3,8)
plot(Time,T1-T2,'--m')
h=legend('DT heatpipe eva-cond',1);
title(' ^oC');
xlabel('min')
ylabel('')
grid on
pause (10)

subplot(3,3,9)
plot(Time,T14,'--m')
h=legend('Temp Water',1);
title(' ^oC');
xlabel('min')
ylabel('')
grid on
pause (10)

end
```