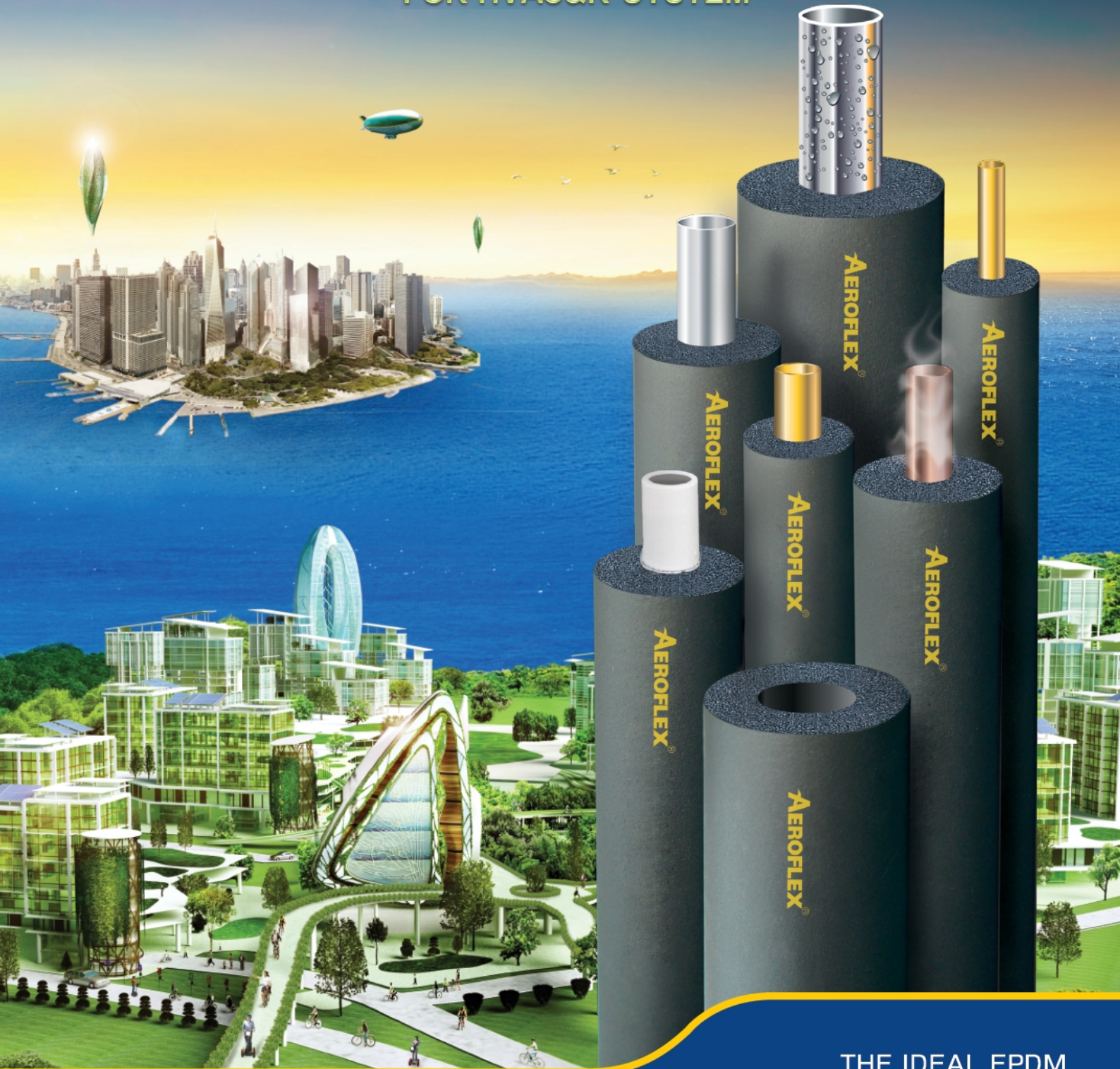


PROGRAM HANDBOOK

# AEROFLEX<sup>®</sup>

closed cell elastomeric thermal insulation  
THE ADVANCED ENERGY CALCULATION PROGRAM  
FOR HVAC&R SYSTEM



THE IDEAL EPDM  
THERMAL INSULATION  
FOR HVAC & R



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# INTRODUCTION TO AEROFLEX PROGRAM

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This program is designed to help calculate and determine the appropriate thickness of AEROFLEX Closed Cell Thermal Insulation for use in HVAC & R applications (heating, ventilation, air condition & refrigeration) and other general information for your convenience.

The technical information and recommendations are average values obtained under typical conditions. The results described herein are based on theoretical guidelines and its accuracy is not guaranteed, particularly when application is used in different environments.

## **Important**

This calculation program has been made to the best of our knowledge, as an analysis aid. Neither the manufacturer of AEROFLEX insulation materials nor Engineering Applications Specialists Inc assumes any responsibility or liability on the use of this software.

Physical properties or chemical properties of AEROFLEX Closed Cell Elastomeric Thermal Insulation represents typical average values obtained in accordance with accepted test methods. However, the manufacturer has no control over the end applications of these materials, particularly when used with or attached to other products.

Therefore, the same results as described herein may not be obtained, or the recommendation made by this program may vary due to possible differences in the actual environments. It is recommended that end user should consult the manufacturer or authorized distributors for more information, otherwise, make their own tests to determine adaptability of material for their particular application.

Due to continuous development of the products, some properties are subject to change without notice.



## FEATURES OF AEROFLEX PROGRAM

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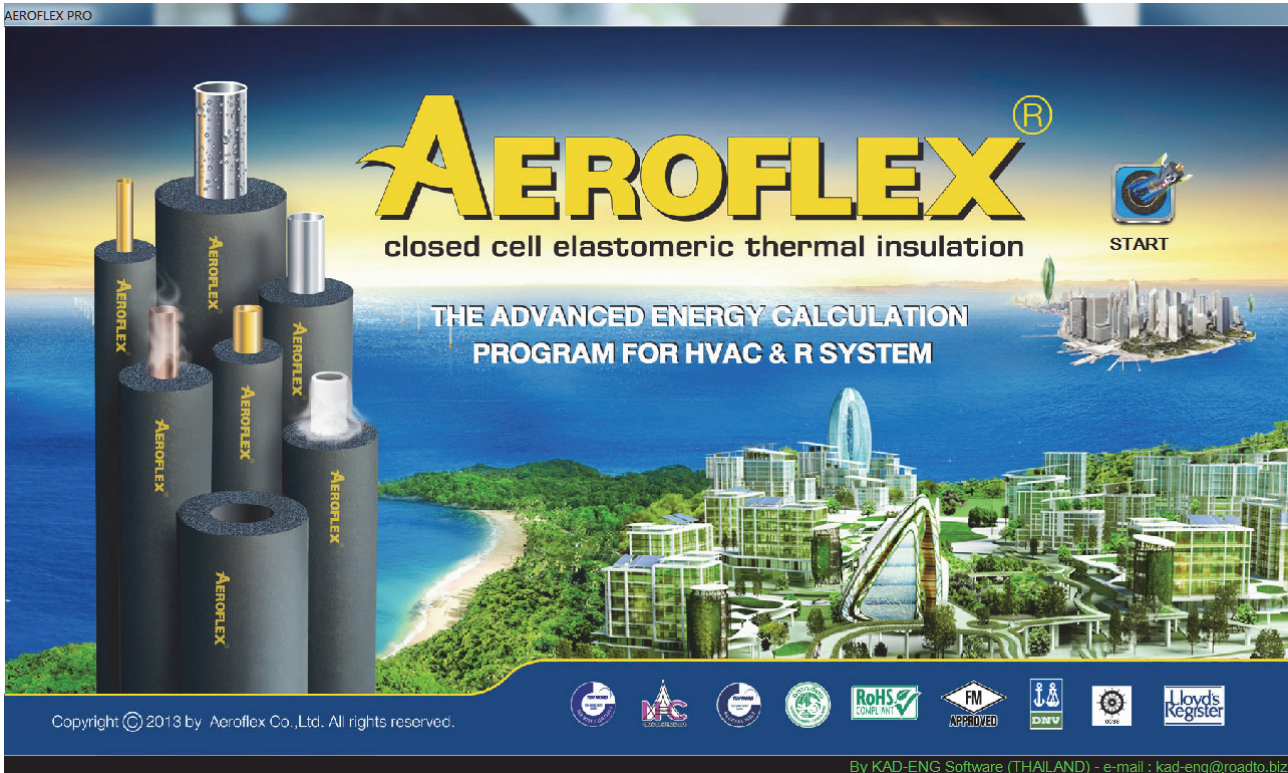
- Can display in 5 languages, i.e. English , German , Chinese , Japanese and Thai.
- This computer program can recommend insulation thickness under following conditions:
  1. Fixed k Value (Fixed Thermal conductivity) and varying %RH (relative humidity).
  2. Fixed %RH (relative humidity) and varying k Value (thermal conductivity).
  3. Check outer surface temperature of insulation with fixed k Value.
  4. Check the thickness of insulation material when fixing the outer surface temperature and varying the k Value.
  5. Under varying insulation thickness, the computer program can show the difference of surface temperature.
  6. Temperature rise, temperature drop in pipelines.
  7. Temperature change in pipelines without flow.
  8. Heat gain or heat loss from the metal pipes when being insulated with insulation materials of varying thickness.
  9. Energy loss of the heating and cooling system.
  10. Graph recommend how to select the economic thickness of insulation.
- Calculate the thickness of AEROFLEX when being used for air-duct to prevent condensation. Enter ambient and operating temperature.
- Calculate AEROFLEX insulation thickness when being used for storage tanks :
  - (1) Rectangular tank
  - (2) Cylinder tank
  - (3) Sphere tanksimply enter the dimensions, initial temperature, final temperature, time for storage, the program will recommend the insulation thickness.
- Calculate the insulation thickness when used with operating tank to determine the thickness of insulation to prevent condensation and heat gain to the operating tank.
- Calculate R Value of various thickness of insulation sheet and tube to required R Value or country regulation.
- Piping system and Air Duct system.
- Convertible between SI Unit and Imperial Unit (English unit).
- Display results in table and graph.
- Convection coefficient (h) can be entered manually.
- Check dew point temperature, relative humidity (%RH) of the atmosphere.
- Pipe sizes, k Value (Thermal Conductivity), % relative humidity (%RH), cost of insulation and energy can be changed or adjusted by user.
- Work fast and easy with mouse.
- Provide full specifications, physical properties & technical information of AEROFLEX Closed Cell Elastomeric Thermal Insulation as per official catalogue.



# SYSTEM REQUIREMENT

## Operating System Requirement

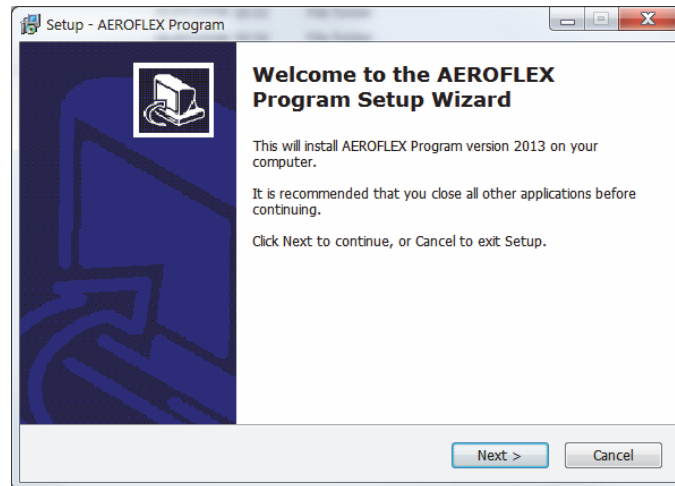
Windows XP , Windows 7 , Windows 8



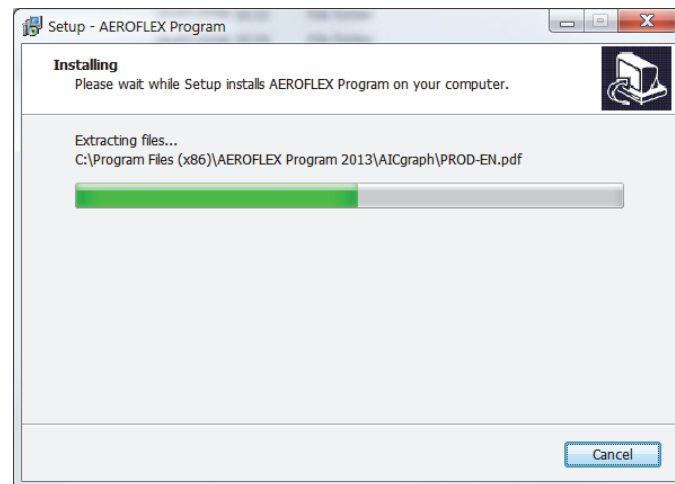
# PROGRAM INSTALLATION & LANGUAGE SWITCH

Insert CDROM to CD drive and wait for AEROFLEX program to appear on screen as in picture no.1.

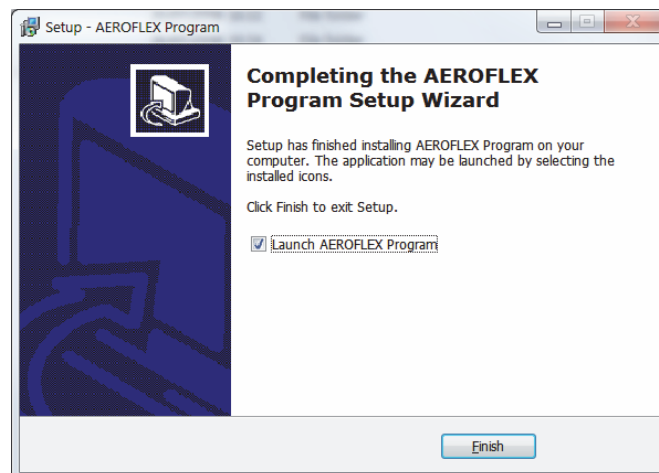
Click [Next>] button to install the program. While installing, Progress Bar will appear to show the installation progress as shown in picture no.2 After installation process is complete, picture no.3 will appear and click [Finish].



Picture No.1 : Setup of AEROFLEX Program after inserting CDROM.



Picture No.2 : Program installation progress on the hard disk

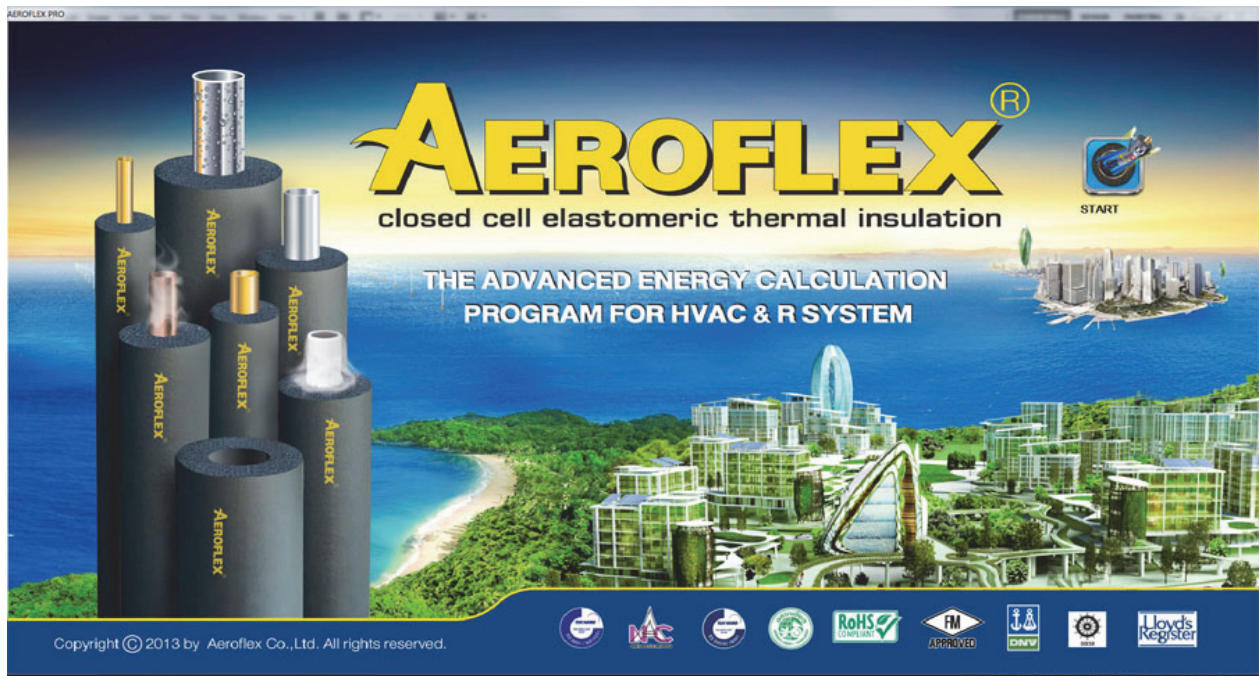


Picture No.3 : Installation progress is complete



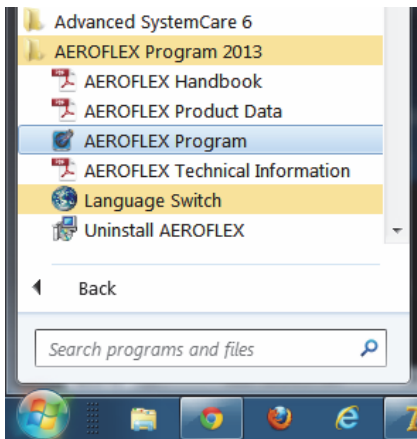
Picture No.4 : Language Switch for language selection

When picture no.3 appears, click [Finish] and Language Switch will appear for language selection. After selecting a language, click [OK] and AEROFLEX Program will operate according to the selected language.

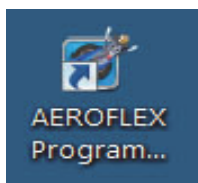




# START MENU AEROFLEX PROGRAM



Picture No.5 Start Menu

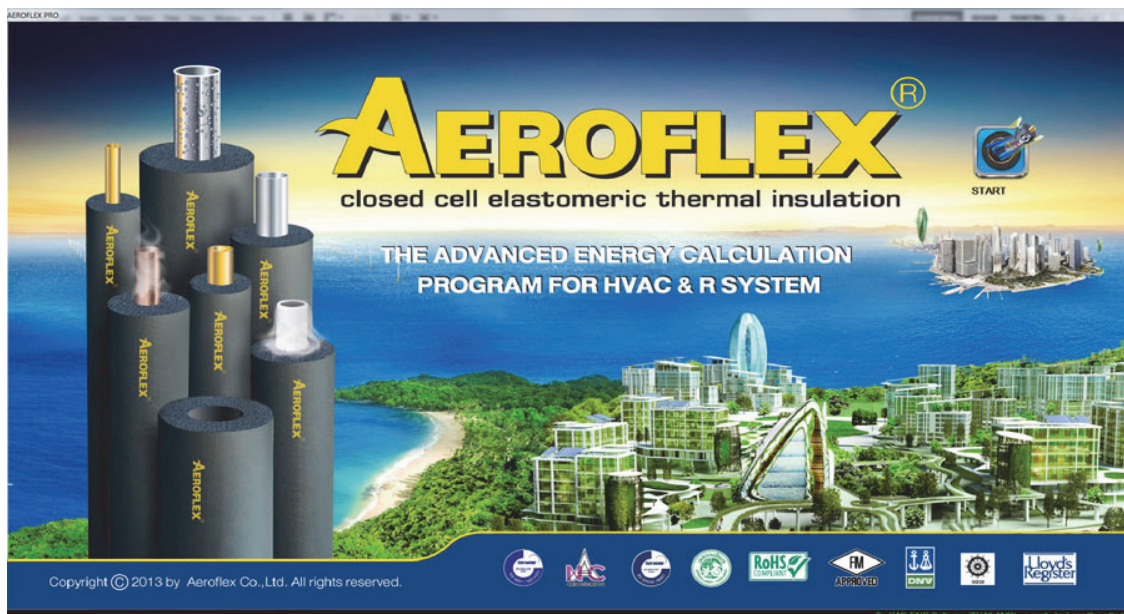


Picture No.6 Icon

After program installation, there are 6 topics under the folder name "AEROFLEX Program" as follow :


- **AEROFLEX Hanbook** is the program instruction showing how to use the program in PDF file.
- **AEROFLEX Product Data** is the catalog of all AEROFLEX Family Products and Specifications in PDF file.
- **AEROFLEX Program** is AEROFLEX Calculation Program for recommended insulation thickness and other related values.
- **AEROFLEX Technical Information** is the documents explaining related formulas used in the program calculation.
- **Language Switch** is the language selection to operate AEROFLEX Calculation Program.
- **Uninstall AEROFLEX** is the program to uninstall AEROFLEX Calculation Program from Windows operation.

During installation process, after selecting a language, AEROFLEX Calculation Program can be started by going to Menu "AEROFLEX Program" or going to Desktop and click on the Icon as shown in picture no.6 to start the program.

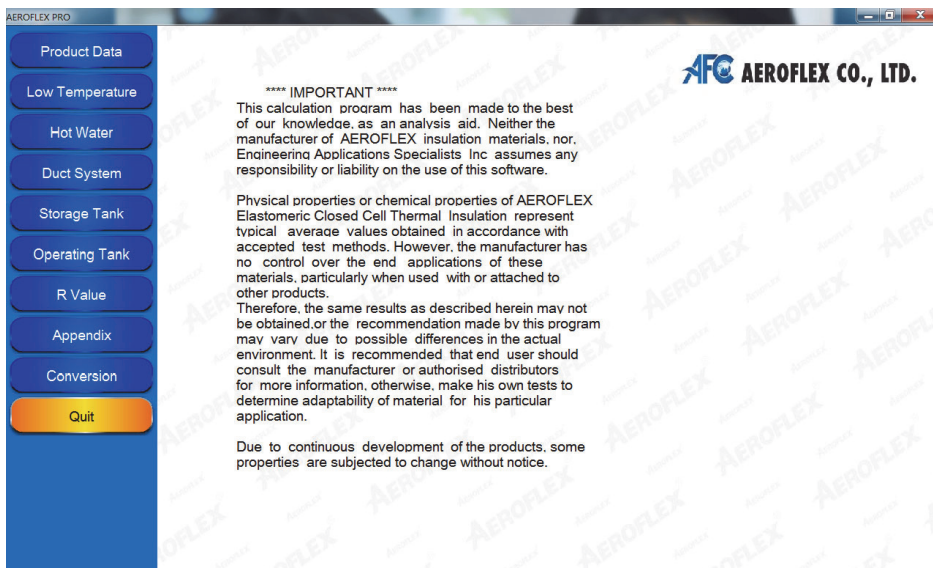


Picture No.7 : AEROFLEX Program First Screen

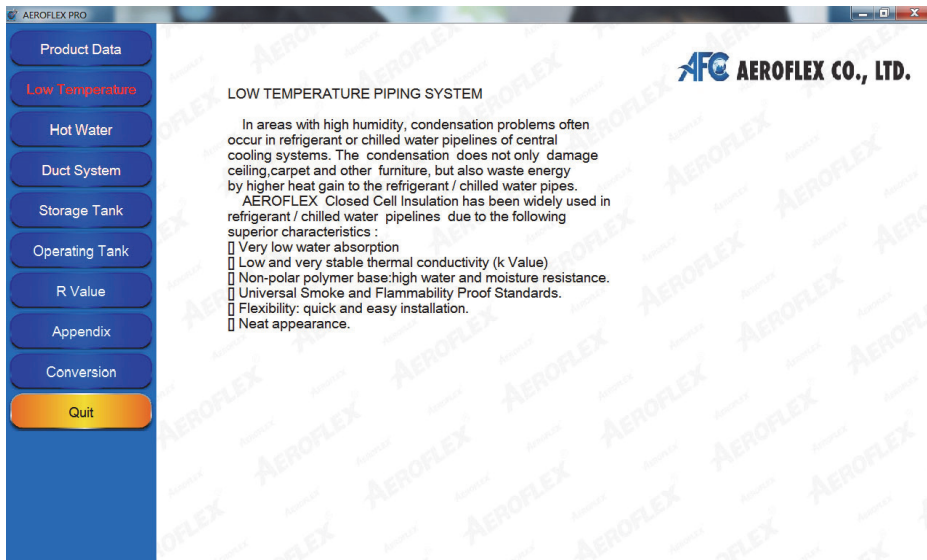
# MAIN MENU

Start the program, by clicking "MR.AEROFLEX ICON"  at top right corner of the front page of " AEROFLEX Program" (picture no.7), the monitor will display main menu as shown in picture no.8. Please read \*\*\* **IMPORTANT** \*\*\* message carefully to assure that it is clearly understood before using this calculation program.

"Main Menu" will be displayed in 2 portions. The "Topic Menu" which has 10 topic buttons as shown in picture no.8 and the explanation of each topic will be displayed on the right hand side if the cursor is placed on the topic title. For example, the explanation on Low Temperature can be displayed by placing the cursor on the "Low Temperature" topic button (picture no.9).



Picture No.8 : Main Menu of AEROFLEX Program



Picture No.9 : Explanation of Low Temperature

Click [Product Data](#) for general information on AEROFLEX Closed Cell Elastomeric Thermal Insulation.

**AEROFLEX<sup>®</sup>**  
closed cell elastomeric thermal insulation

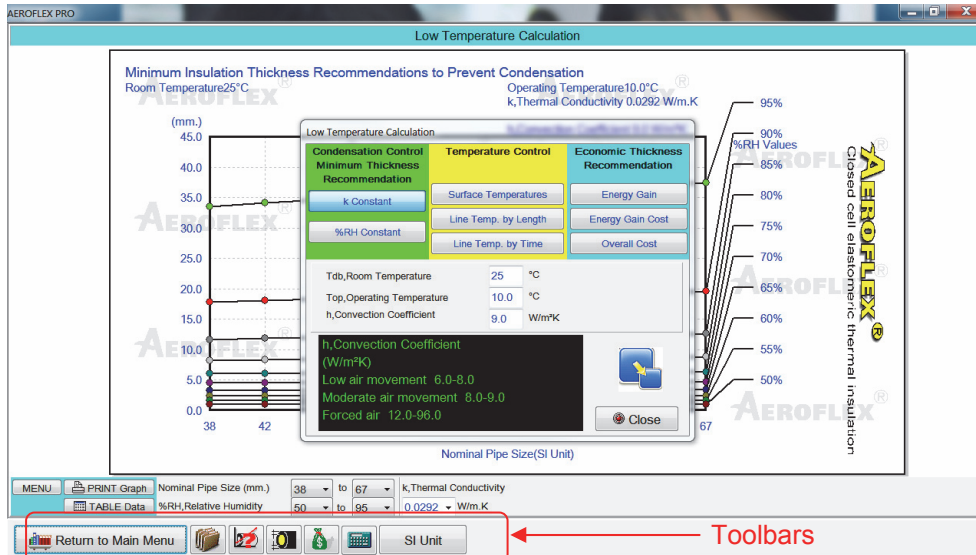
THE IDEAL EPDM  
THERMAL INSULATION  
FOR HVAC & R

RoHS COMPLIANT FM APPROVED DNV Lloyd's Register

Ready 1 of 32 91.61% File: PROD-EN.pdf

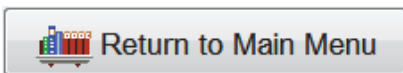


# TOOLBARS



Picture No.10 : Toolbars

Toolbars at the bottom (picture no.10) performs the following functions:



Click to return to main menu.



Click this icon to change the parameters for further calculations i.e. pipe size, thermal conductivity value (k Value), %RH, surface temperature and other factors (see more details on page 28).



Click this icon to check thermal conductivity value (AEROFLEX k Value) at various temperatures (see more details on page 31).



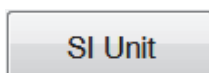
Click this icon to enter or change size of insulation material. This data is necessary for calculating the R Value (see more details on page 32).




Click this icon to enter cost of insulation material plus installation cost. This data is necessary for calculating the economic thickness recommendation (see more details on page 33).

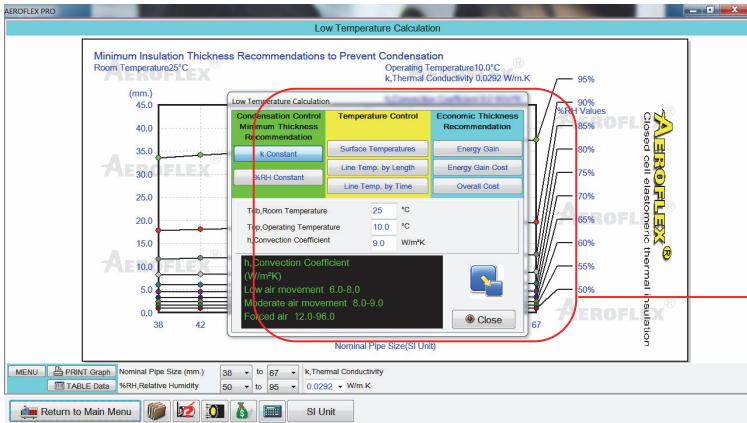


Click this icon to use the calculator which is provided by MS WINDOWS system.

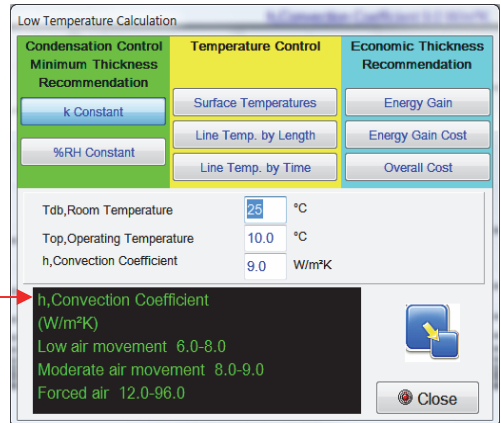


Three unit systems are available that can be selected by clicking this icon i.e. Imperial Unit (English Unit) and SI UNIT.

Click  button to calculate the recommended thickness of the insulation. The menu of Low Temperature system calculation consists of 3 classified groups with 8 calculation methods as shown in pictures no.11 and no. 12.



Picture No.11 : The calculation form of the Low Temperature system and windows for entering the data for further calculation.



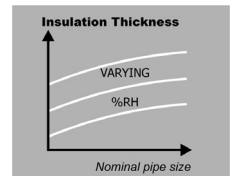
Picture No.12 : Menu of Low Temperature system calculation which consists of 3 classified group with 8 calculation methods.

## Program calculation usage :

### 1. Condensation : Minimum Thickness Recommendation

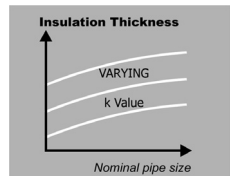
1.1 

This button is for calculating minimum thickness of insulation tube/sheet required to prevent condensation with fixed k Value (Thermal Conductivity) and varying %RH (Relative Humidity) values.



1.2 

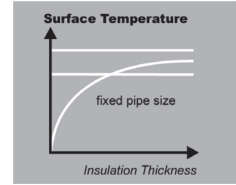
This button is for calculating minimum thickness of insulation tube/sheet required to prevent condensation with fixed %RH value and varying k Values (Thermal Conductivity).



## 2. Temperature Control

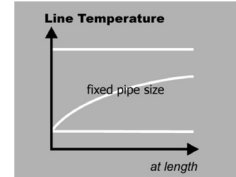
2.1

This button is for checking surface temperature of the insulation at selected pipe sizes.



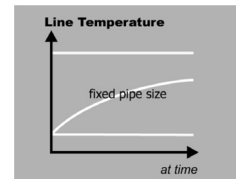
2.2

This button is for checking refrigerant or chilled water temperature at varying lengths of selected pipe sizes.



2.3

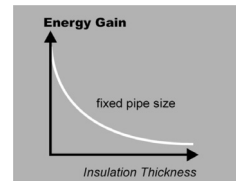
This button is for checking the rise in temperature of refrigerant or chilled water by time.



## 3. Economic Thickness Recommendation

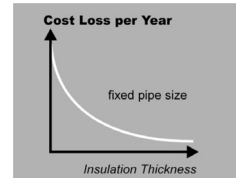
3.1

This button is for calculating heat gain per meter or feet for various insulation thickness.



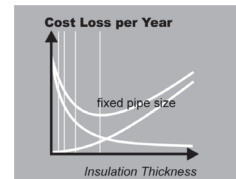
3.2

This button is for calculating energy loss cost per length per year at various insulation thickness.



3.3

This button is for checking the economic thickness of insulation to determine the minimum total cost of insulation, installation and energy loss. The graph also provides the minimum insulation thickness to prevent condensation at various %RH.



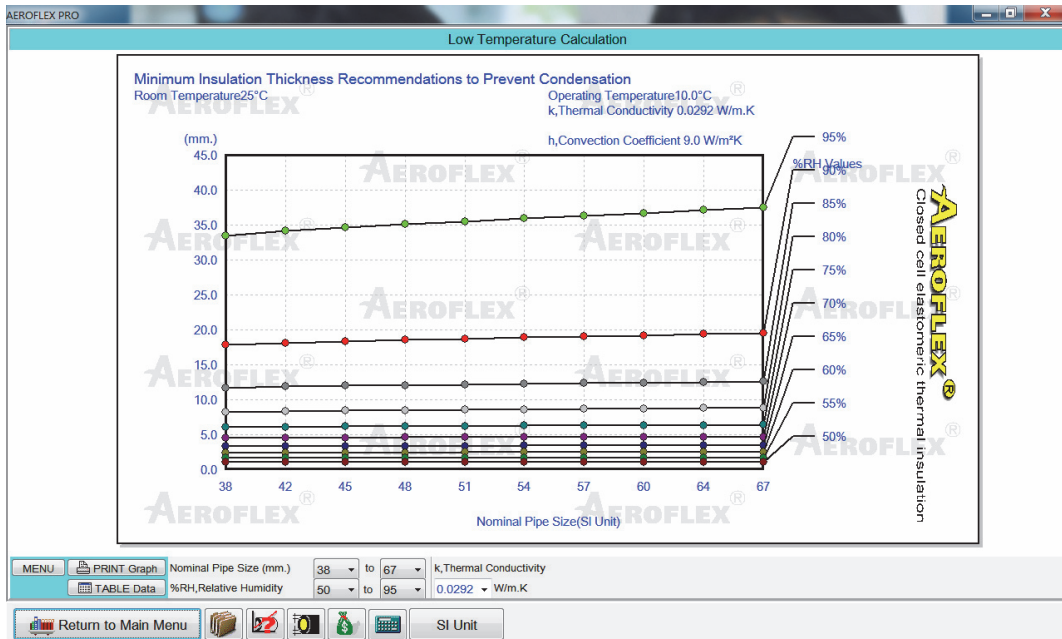
Select the method of calculation from the menu (picture no.12), enter all data required for calculation as shown in picture no.11. If the graph does not appear in the background, data entered is incomplete or inappropriate.

Click  to close the Low Temperature calculation windows for displaying the graph in full screen (picture no.13). The graph can also be

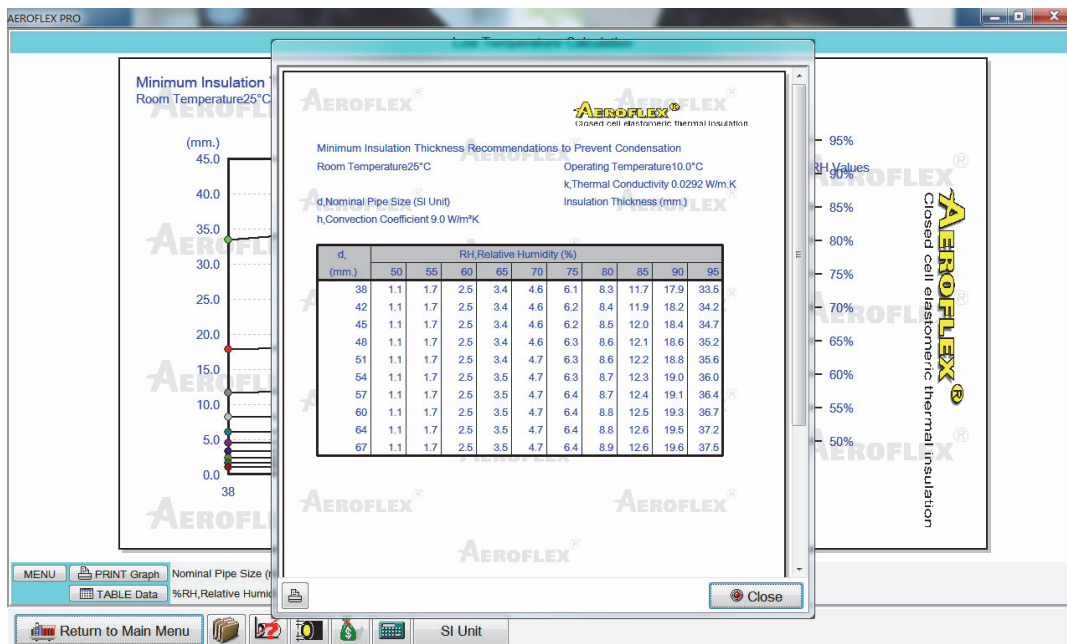


displayed by dragging and moving the Low Temperature calculation window. To move the Low Temperature calculation window, click, hold and move the title bar.


Click **TABLE Data** to view the results in table form (picture no.14). To start a new calculation click **MENU** again (picture no.11).

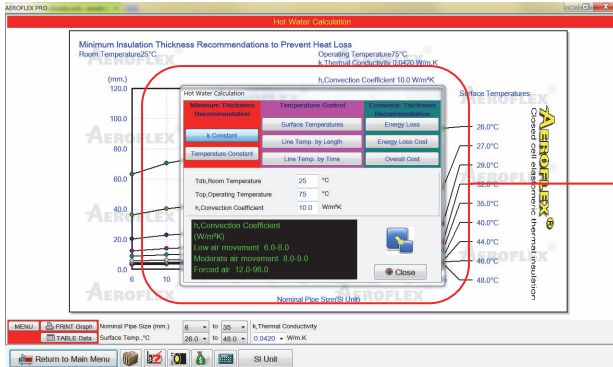


Picture No.13 : Calculation result in graph

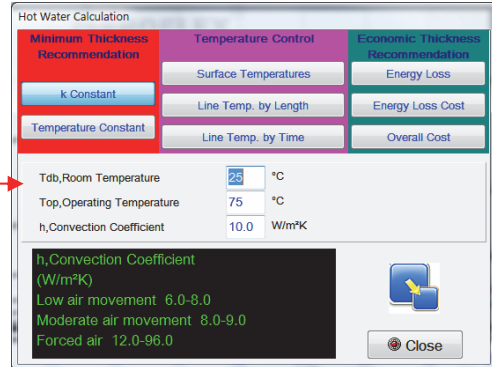


Picture No.14 : Calculation result in table form

Click at  button to calculate the recommended thickness of the insulation. The menu of hot water system calculation consists of 3 classified groups with 8 calculation methods as shows in picture no.15 and 16.



Picture No.15 : Calculation form of hot water system and windows for entering the data for further calculation.



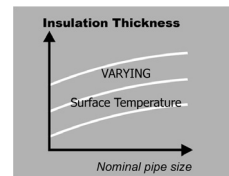
Picture No.16 : Menu of hot water system calculation which consists of 3 classified groups with 8 calculation methods.

## Program calculation usage :

### 1. Minimum Insulation Thickness Recommendation

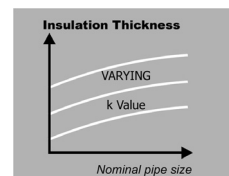
#### 1.1 k Constant

This button is for calculating minimum thickness of insulation to obtain the desired surface temperature of insulation with fixed k Value (Thermal Conductivity) and varying surface temperatures of insulation.



#### 1.2 Temperature Constant

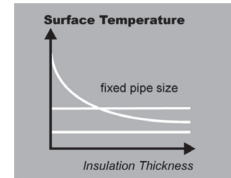
This button is for calculating the minimum thickness of insulation with fixed surface temperature of insulation and varying k Value (Thermal Conductivity).



## 2. Temperature Control

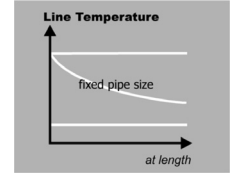
2.1

This button is for calculating the surface temperatures of varying insulation thickness.



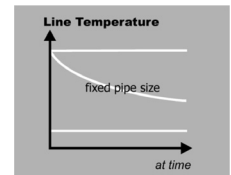
2.2

This button is for calculating the temperature drop on the hot water at selected pipe size by length.



2.3

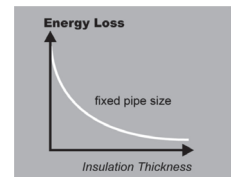
This button is for calculating the temperature drop of hot water at selected pipe size by time.



## 3. Economic Thickness Recommendation

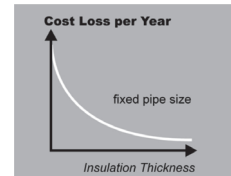
3.1

This button is for calculating the energy loss when using various thicknesses of insulation.



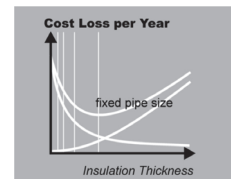
3.2

This button is for calculating energy loss cost per length per year with various insulation thicknesses.



3.3

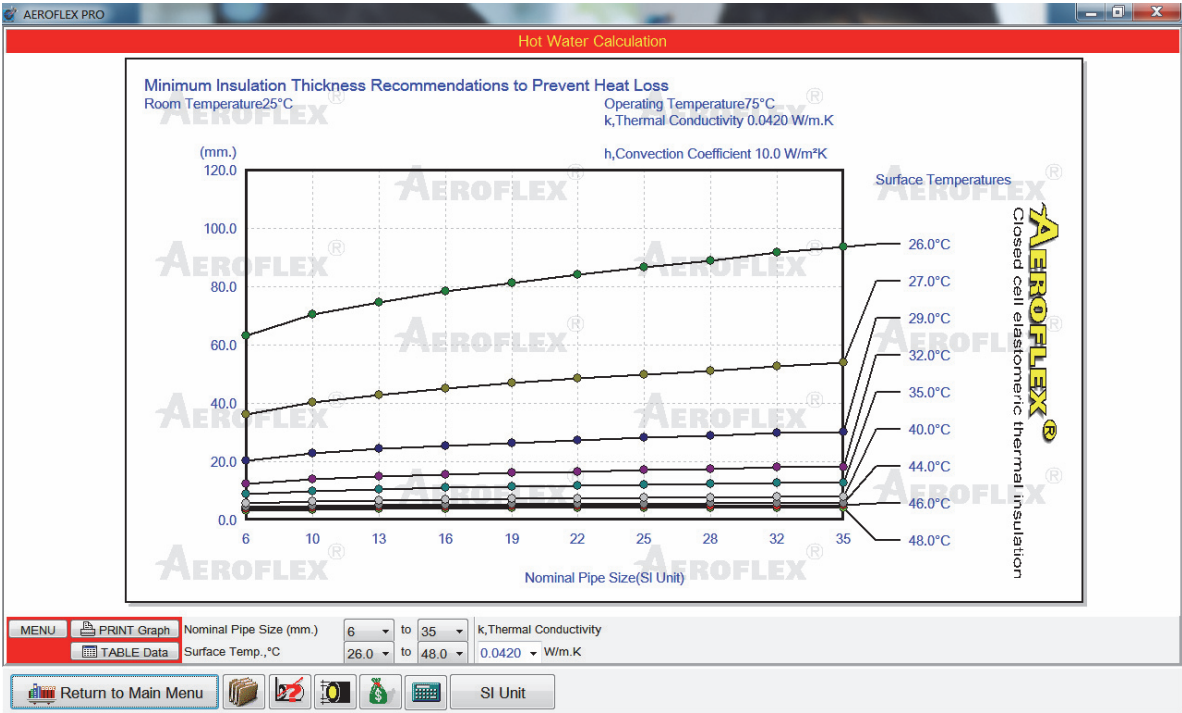
This button is for calculating the economic thickness of insulation to determine the minimum total cost of insulation, installation and energy loss. The graph also provides surface temperature of insulation at various thicknesses.



Select the method of calculation from the menu (picture no.16), enter all data required for calculation as shown in picture no.15 . If the graph does not appear in the background, data entered is incomplete or inappropriate.

Click  to close the hot water calculation window for displaying the graph in full screen (picture no.17). The graph can also be displayed by dragging and moving the hot water calculation window. To move the hot water calculation window, click, hold and move the title bar.

Click  to view the results in table form (picture no.18). To start a new calculation click  again (picture no.15).



Picture No.17 : Calculation result in graph form

Minimum Insulation Thickness Recommendations to Prevent Heat Loss

Room Temperature 25°C  
Operating Temperature 75°C  
k, Thermal Conductivity 0.0420 W/m.K  
h, Convection Coefficient 10.0 W/m²K

d, Nominal Pipe Size (SI Unit)  
Insulation Thickness (mm.)

d, (mm.)	Surface Temperatures (°C)								
	26.0	27.0	29.0	32.0	35.0	40.0	44.0	46.0	48.0
6	63.4	36.2	20.5	12.6	9.1	6.0	4.5	3.9	3.4
10	70.7	40.6	23.0	14.2	10.2	6.6	5.0	4.3	3.8
13	74.9	43.1	24.4	15.0	10.7	7.0	5.2	4.5	3.9
16	78.5	45.2	25.6	15.7	11.2	7.2	5.4	4.7	4.0
19	81.6	47.0	26.6	16.3	11.6	7.4	5.5	4.8	4.1
22	84.3	48.6	27.5	16.8	11.9	7.6	5.6	4.9	4.2
25	86.8	50.1	28.3	17.3	12.2	7.8	5.7	4.9	4.3
28	89.1	51.4	29.0	17.6	12.4	7.9	5.8	5.0	4.3
32	91.9	53.0	29.9	18.1	12.7	8.0	5.9	5.1	4.4
35	93.8	54.1	30.4	18.4	12.9	8.1	5.9	5.1	4.4

Close

Picture No.18 : Calculation result in table form



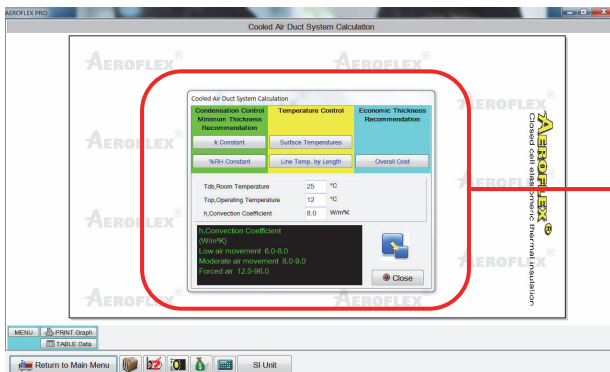
Click at **Duct System** button to calculate the recommended thickness of the insulation for Duct System. There are 2 options in the menu of Air Duct system : 1. Cooled Air and 2. Hot Air as shown in picture no. 19



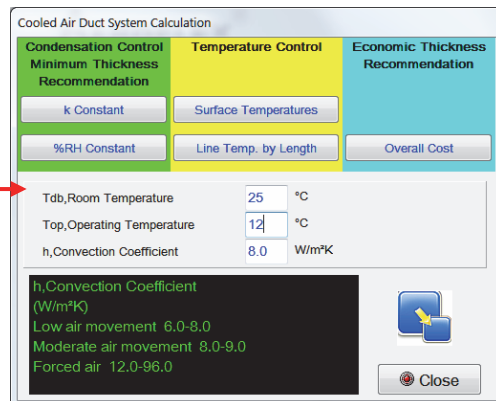
Picture No.19 : Duct System Menu

## Cooled Air Duct System :

Click at **Cooled Air** button to calculate the recommended thickness of the insulation. The menu of cooled air duct system calculation consists of 3 classified groups with 5 calculation methods as shows in picture no.20 and 21.



Picture No.20 : Calculation form of cooled air duct system and windows for entering the data for further calculation.



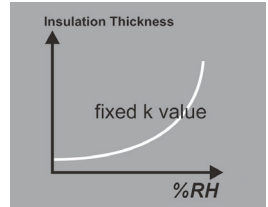
Picture No.21 : Menu of cooled air duct system calculation which consists of 3 classified groups with 5 calculation methods.

# 1. Minimum Insulation Thickness Recommendation

1.1

k Constant

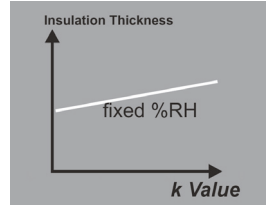
This button is for calculating minimum thickness of insulation sheet required to prevent condensation with fixed k Value (Thermal Conductivity)



1.2

%RH Constant

This button is for calculating minimum thickness of insulation sheet required to prevent condensation with fixed %RH value

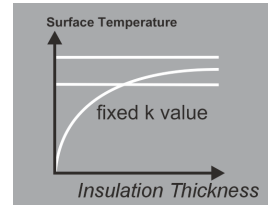


# 2. Temperature Control

2.1

Surface Temperatures

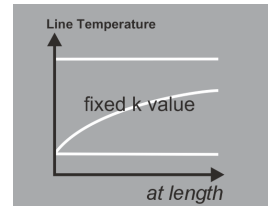
This button is for checking surface temperature of the insulation at selected %RH



2.2

Line Temp. by Length

This button is for checking cooled air duct temperature at varying lengths of duct

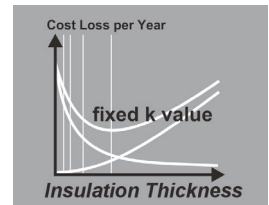


# 3. Economic Thickness Recommendation


3.1

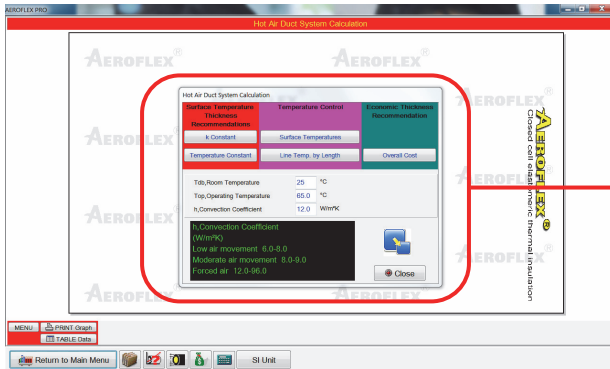
Overall Cost

This button is for checking the economic thickness of insulation to determine the minimum total cost of insulation, installation and energy loss. The graph also provides the minimum insulation thickness to prevent condensation at various %RH.

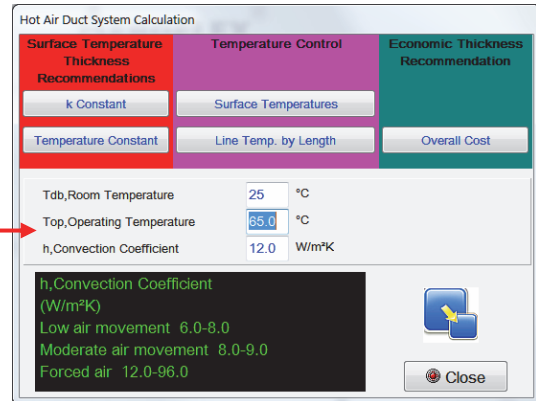


## Hot Air Duct System :

Click at  button to calculate the recommended thickness of the insulation. The menu of hot air duct system calculation consists of 3 classified groups with 5 calculation methods as shows in picture no.22 and 23.



Picture No.22 : Calculation form of hot air duct system and windows for entering the data for further calculation.



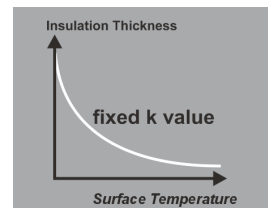
Picture No.23 : Menu of hot air duct system calculation which consists of 3 classified groups with 5 calculation methods.

## 1. Minimum Insulation Thickness Recommendation

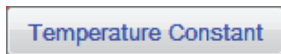
1.1



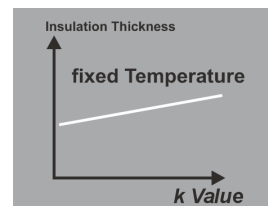
This button is for calculating minimum thickness of insulation to obtain the desired surface temperature of insulation with fixed k Value (Thermal Conductivity) and varying surface temperatures of insulation.



1.2

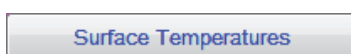


This button is for calculating the minimum thickness of insulation with fixed surface temperature of insulation and varying k Value (Thermal Conductivity).

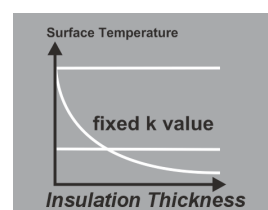


## 2. Temperature Control

2.1



This button is for calculating the surface temperatures of varying insulation thickness.

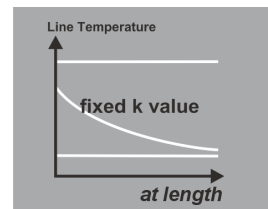




2.2

Line Temp. by Length

This button is for calculating the temperature drop on the hot air duct at selected duct by length.

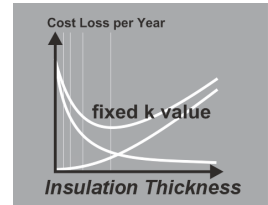


### 3. Economic Thickness Recommendation

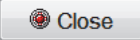
3.1

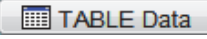
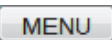
Overall Cost

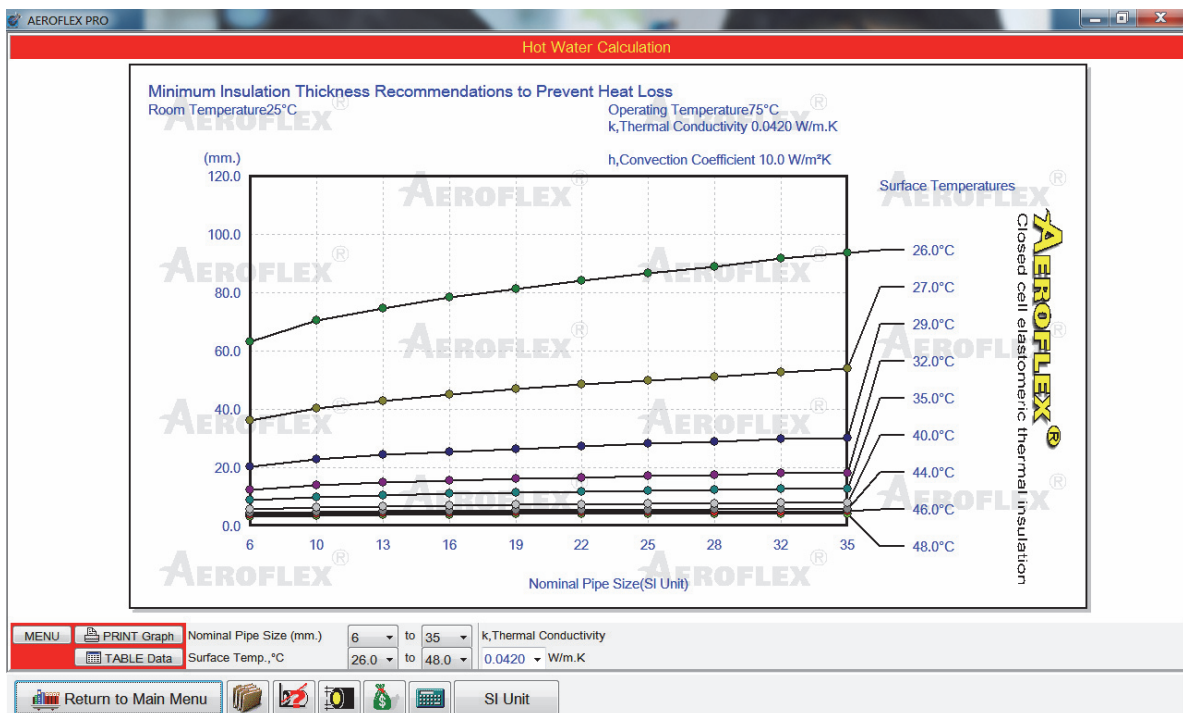
This button is for calculating the economic thickness of insulation to determine the minimum total cost of insulation, installation and energy loss. The graph also provides surface temperature of insulation at various thicknesses.



Select the method of calculation from the menu (picture no.23), enter all data required for calculation as shown in picture no.22 . If the graph does not appear in the background, data entered is incomplete or inappropriate.

Click  to close the hot air duct calculation window for displaying the graph in full screen (picture no.24). The graph can also be displayed by dragging and moving the hot air duct calculation window. To move the hot air duct calculation window, click, hold and move the title bar.

Click  to view the results in table form (picture no.25). To start a new calculation click  again (picture no.23).



Picture No.24 Displays calculation result in graph form.

**AEROFLEX®**  
Closed cell elastomeric thermal insulation

**Minimum Insulation Thickness Recommendations to Prevent Heat Loss**

Room Temperature 25°C      Operating Temperature 75°C  
 k, Thermal Conductivity 0.0420 W/m.K  
 h, Convection Coefficient 10.0 W/m²K

d, Nominal Pipe Size (SI Unit)  
 Insulation Thickness (mm.)

d, (mm.)	Surface Temperatures (°C)									
	26.0	27.0	29.0	32.0	35.0	40.0	44.0	46.0	48.0	
6	63.4	36.2	20.5	12.6	9.1	6.0	4.5	3.9	3.4	
10	70.7	40.6	23.0	14.2	10.2	6.6	5.0	4.3	3.8	
13	74.9	43.1	24.4	15.0	10.7	7.0	5.2	4.5	3.9	
16	78.5	45.2	25.6	15.7	11.2	7.2	5.4	4.7	4.0	
19	81.6	47.0	26.6	16.3	11.6	7.4	5.5	4.8	4.1	
22	84.3	48.6	27.5	16.8	11.9	7.6	5.6	4.9	4.2	
25	86.8	50.1	28.3	17.3	12.2	7.8	5.7	4.9	4.3	
28	89.1	51.4	29.0	17.6	12.4	7.9	5.8	5.0	4.3	
32	91.9	53.0	29.9	18.1	12.7	8.0	5.9	5.1	4.4	
35	93.8	54.1	30.4	18.4	12.9	8.1	5.9	5.1	4.4	

**AEROFLEX®**

Close



Picture No.25 : Calculation result in table form

## Storage Tank

Storage tank has 3 types : Rectangular, Cylindrical, and Spherical. To calculate the thickness for each type, select the appropriate type in the menu and input the necessary data as shown in picture no.26. The recommend thickness of AEROFLEX insulation will appear immediately in the answer column. N/A will be displayed in the answer column if the data is incomplete or inappropriate.

Storage Tank

RECTANGULAR TANK ▾

Width
 m.

Height
 m.

Length
 m.

Tdb,Room Temperature
 °C
 

Low Temperature  
 Hot Water

Tst,Storage Temperature
 °C

h,Convection Coefficient
 W/m<sup>2</sup>K

°C

k,Thermal Conductivity
 W/m.K

Storage Time
 hr.

Percent water storage
 %

Answer : Minimum Insulation Thickness
N/A
mm.

```



h,Convection Coefficient
(W/m²K)
Low air movement 6.0-8.0
Moderate air movement 8.0-9.0
Forced air 12.0-96.0
          
```

Picture No.26 : Calculation program for storage tank.



Click [Operating Tank](#) to calculate the minimum insulation thickness recommended to prevent condensation. Key in all necessary data, the program will calculate the minimum thickness of AEROFLEX closed cell insulation to prevent condensation and will also calculate the heat gain on the operating tank, as shown in picture no.27. N/A will be displayed in the answer column if the data is incomplete or inappropriate.

**Operating Tank (low Temperature)**

Tdb,Room Temperature	<input type="text" value="25"/>	°C
Top,Operating Temperature	<input type="text" value="10"/>	°C
%RH,Relative Humidity	<input type="text" value="70"/>	%
h,Convection Coefficient	<input type="text" value="9"/>	W/m <sup>2</sup> K
k,Thermal Conductivity	<input type="text" value="0.0375"/>	W/m.K

**Minimum Insulation Thickness Recommendations to Prevent Condensation**

7 mm.

**Heat Gain**

52.7 W/sq.m.

**h,Convection Coefficient (W/m<sup>2</sup>K)**

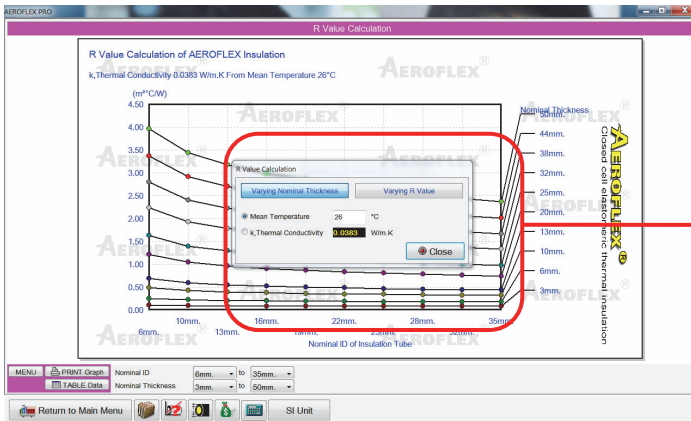
Low air movement 6.0-8.0

Moderate air movement 8.0-9.0

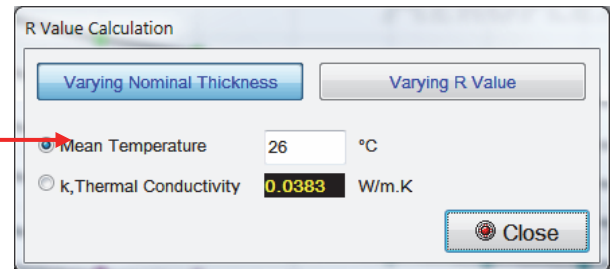
Forced air 12.0-96.0

Picture No.27 : Calculation program for operating tank.

Click at **R Value** to calculate thickness by varying R Values or vice versa. There are 2 calculation methods as shows in pictures no.28 and 29. Above values can be obtained by entering either k Value or mean temperature. After entering mean temperature , the AEROFLEX k Value will appear and ready for calculation.



Picture No.28 : Calculation form of R Value and windows for entering the data for further calculation.

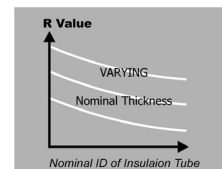


Picture No.29 : Menu of R Value calculation which consists of 2 calculation methods.

## Program calculation usage :

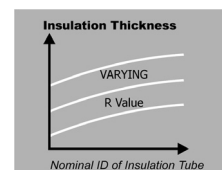
1. **Varying Nominal Thickness**

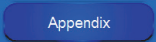
This button is for calculating R Value of each nominal thickness of AEROFLEX insulation.



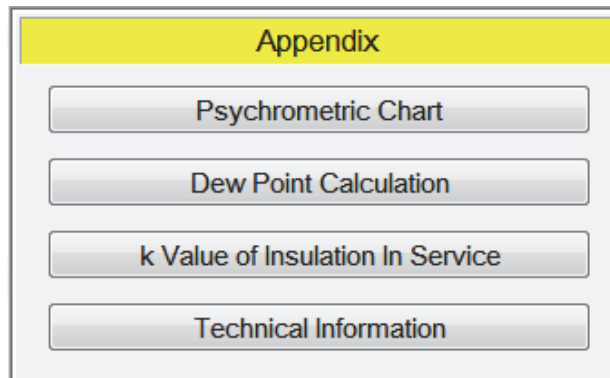
2. **Varying R Value**

This button is for calculating the thickness of insulation required to have the desired R Value.

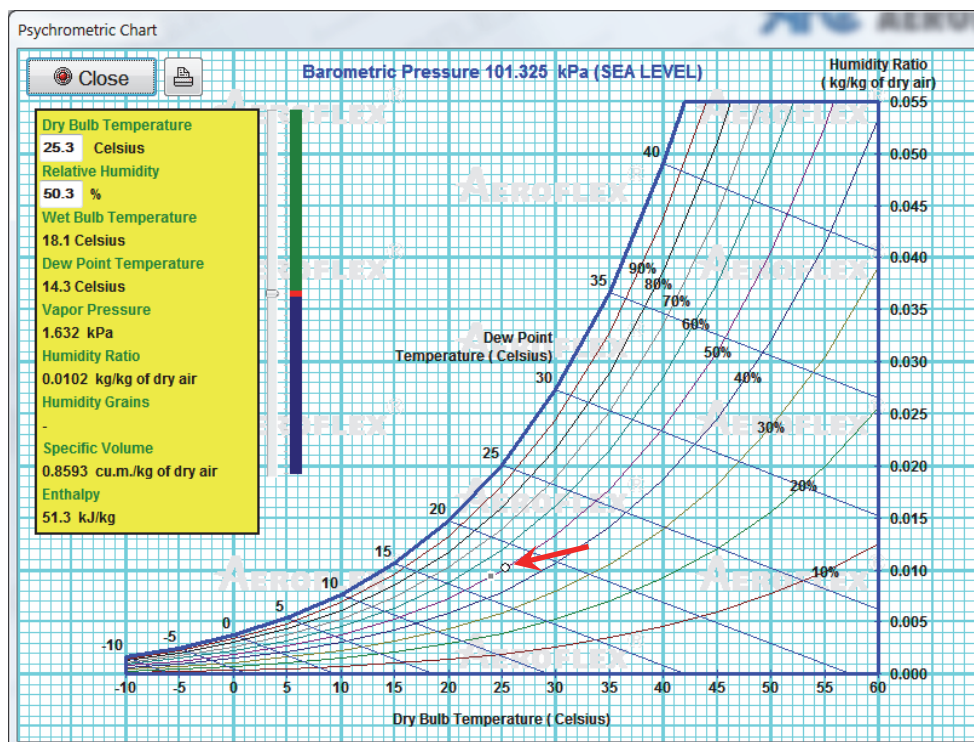


After clicking , picture no.30 will appear on the screen  
Other information in the appendix consists of :

- Psychrometric Chart
- Dew Point Calculation
- k Value of Insulation In Service
- Technical Information



Picture No. 30 : Appendix List



Picture No. 31 : Psychrometric Chart when clicked directly on the required position

- There are 2 dialogs in Psychrometric Chart, one shows the calculation result in numbers, another is the chart. To use the chart for calculation, click directly on the required position of the chart, for example, for calculation of ambient temperature at 35°C (dry bulb) and %RH at 50%, click on the red arrow as shown in picture no.31



- For Dew Point Calculation, key the values in Tdb (Room temperature) and Tdp (dew point temperature) in order to get the calculation result of %RH (relative humidity), or key the values in Tdb (Room temperature) and %RH (relative humidity) in order to get the calculation result of Tdp (dew point temperature).

In picture no.32, we key in the values as Tdb = 25 °C and Tdp = 22 °C, then the program calculates and shows the result of %RH = 83%.


If we key in the values as Tdb = 25 °C and %RH = 74%, the calculation result of Tdp (dew point temperature) will show on the right side as 20°C.

Picture No.32 : Dew Point Calculation

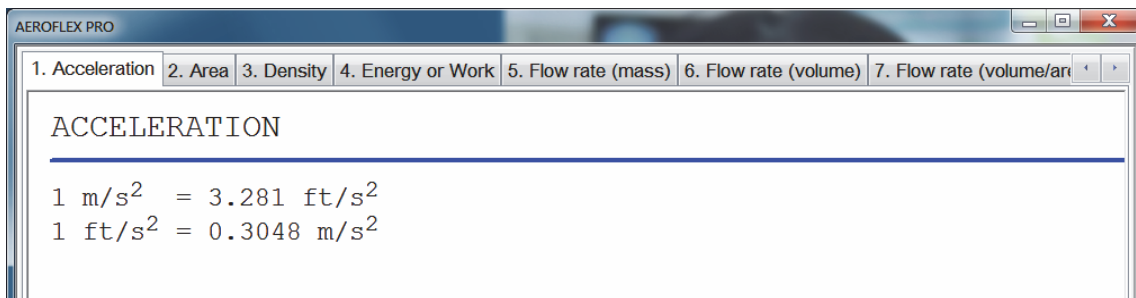
- For k Value of Insulation In Service, it is the calculation to find the appropriate k Value in service by keying in the values of Tdb (Room temperature), Surface Temperature, Top (Operating Temperature), h (Convection Coefficient), Nominal Pipe size and Insulation Thickness, then the program will calculate k Value as shown in picture no.33

Picture No.33 : calculation of k Value of Insulation In Service

- For Technical Information PDF document file consists of abbreviations , symbols , formula , convection coefficient , physical constants value

After clicking , picture no.34 will be shown on the screen. This menu consists of 18 categories and can be selected by clicking tabbars :

1. Acceleration
2. Area
3. Density
4. Energy or work
5. Flow rate (mass)
6. Flow rate (volume)
7. Flow rate (volume/area)
8. Force
9. Heat flux
10. Heat loss coefficient of building
11. Heat transfer coefficient
12. Length
13. Mass
14. Power
15. Temperature
16. Thermal conductivity or resistance
17. Volume
18. Volume flow rate




Picture No.34 : units conversion.

Click  to exit AEROFLEX program to windows.

# Toolbars



Click  , picture no.35 will be shown on the screen. Key in desired preset data or make the necessary change of data and information for use in calculation program. There are 6 groups of parameter:

1. **Pipe Sizes**

Input the data of nominal pipe size, O.D.(outer diameter) and I.D. (inner diameter) for copper pipe and iron pipe, see picture no.35.

2. **k Values**

There are 2 vertical sections to enter k Values, one side for low temperature and other for hot water calculation program, see picture no.36.

3. **% RH**

Input desired %RH values for use in the calculation program, see picture no.37.

4. **R Values**

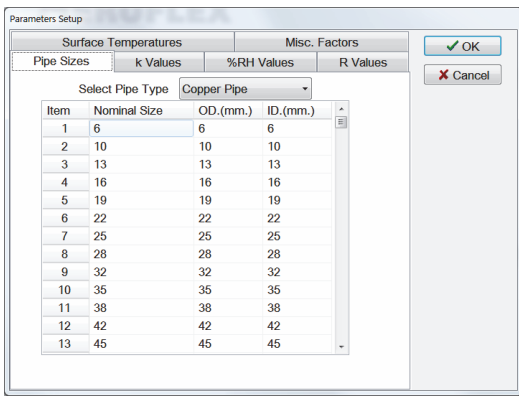
Input desired R Values of the insulation, see picture no.38.

5. **Surface Temperatures**

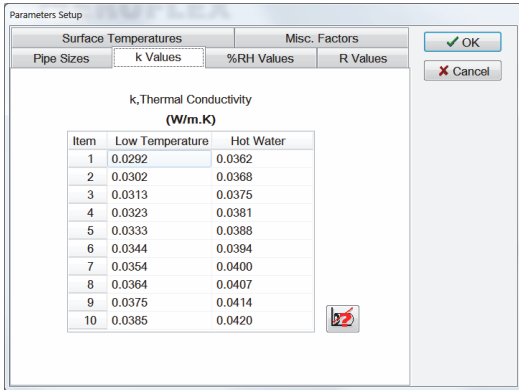
Input desired outer surface temperatures of the insulation, see picture no.39.

6. **Misc. Factors**

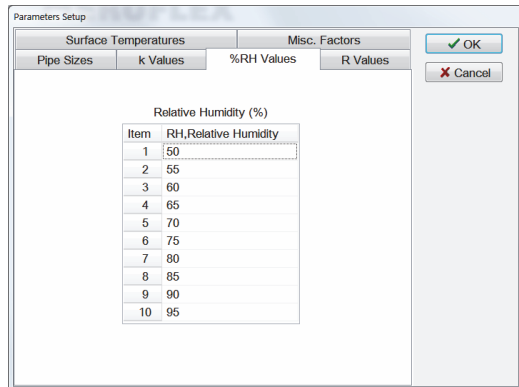
Entering the factors used in the overall cost calculation program such as currency, working days per year, work hours per day, energy source and energy cost as shown in picture no. 40.



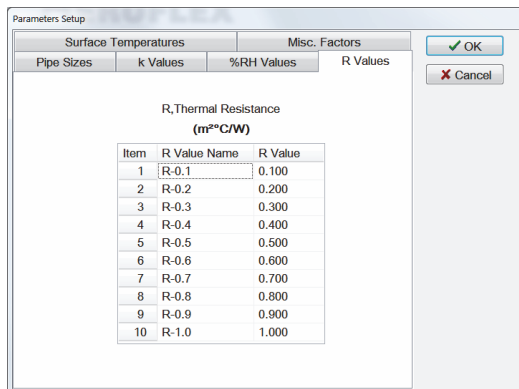
Picture No.35 : Standard copper and iron pipe sizes.



Picture No.36 : k Values for both low temperatures & hot water calculation program.



Picture No.37 : Required %RH data.



Picture No.38 : Required R Values.



Parameters Setup

Pipe Sizes | **k Values** | %RH Values | R Values

Surface Temperatures | Misc. Factors

Surface Temperatures  
(°C)

Item	T, Temperature
1	25.5
2	26.0
3	27.0
4	29.0
5	32.0
6	35.0
7	40.0
8	44.0
9	46.0
10	48.0

OK Cancel

Picture No.39 : Required surface temperatures.

Parameters Setup

Pipe Sizes | k Values | %RH Values | R Values

Surface Temperatures | **Misc. Factors**

Convection Coefficient:

Unit of currency:

Working day per year:  days

Working Hours per day:  hr.

Source of Energy

Source of Energy:

Electricity	<input type="text" value="0.095"/>	\$/kW.hr		
Gas	<input type="text" value="0.297"/>	\$/kg	<input type="text" value="6.0"/>	kW.hr/kg
Oil Fuel	<input type="text" value="0.270"/>	\$/Ltr	<input type="text" value="7.0"/>	kWhr/Ltr
Other	<input type="text" value="0.080"/>	\$/kW.hr		

Air Conditioning System Power Consumption

kW/TR

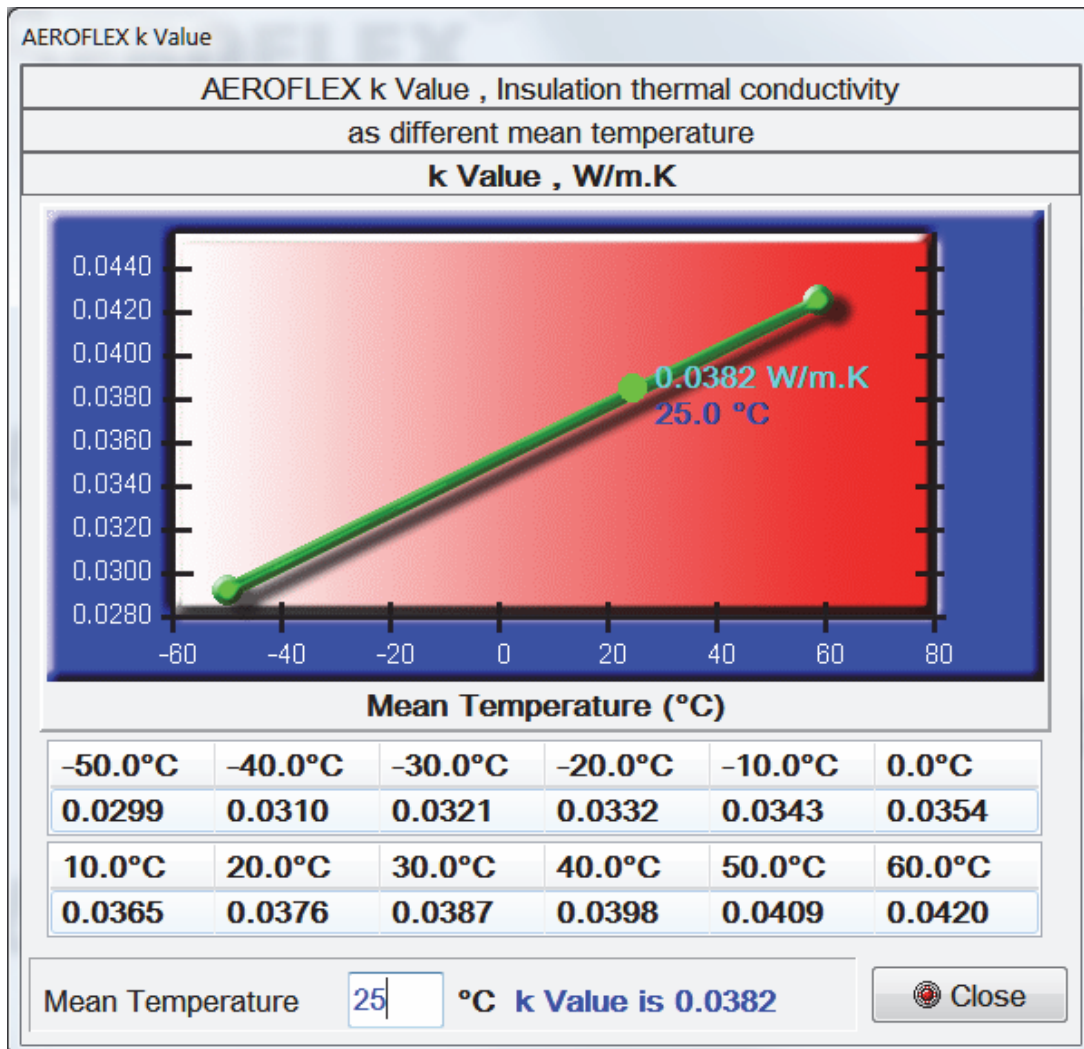
OK Cancel

Picture No.40 : Required data in Misc. Factors for overall cost calculation.




Thermal conductivity value (k Value) of AEROFLEX varies directly with an average temperature of both surfaces. Therefore, k Value is very important for each calculation. The k Value of AEROFLEX can be checked from 3 methods (see picture no.41).

1. Click on the green dot along the graph, the k Value will be displayed in various mean temperature.
2. Read the k Value from the table.
3. To check the accurate k Value, enter average temperature, the k Value will be displayed at the right hand side.



Picture No.41 : The program for calculation or checking the k Value of AEROFLEX closed cell elastomeric thermal insulation.

 **Insulation Size**

Click  , picture no.42 will be shown on the screen. Input all required preset data or make the necessary change of nominal thickness, actual thickness for both sheet and tube, and also ID (Inner Diameter) of insulation tube as shown in pictures no.42, no.43 and no.44 for use in calculation program.

Insulation Size

Sheet | ID of Insulation Tube | Insulation Tube Actual Thickness

Item	Nominal	Actual (mm.)
1	3mm.	3.0
2	6mm.	6.0
3	10mm.	10.0
4	13mm.	13.0
5	20mm.	20.0
6	25mm.	25.0
7	32mm.	32.0
8	38mm.	38.0
9	44mm.	44.0
10	50mm.	50.0
11	56mm.	56.0
12	63mm.	63.0

Please refer to ACROFLEX Standard

OK Cancel

Picture No.42 : Required nominal & actual insulation thickness of sheet already filled in.

Insulation Size

Sheet | ID of Insulation Tube | Insulation Tube Actual Thickness

ID of Insulation Tube

Item	Nominal	Actual (mm.)
1	6mm.	6.0
2	10mm.	10.0
3	13mm.	13.0
4	16mm.	16.0
5	19mm.	19.0
6	22mm.	22.0
7	25mm.	25.0
8	28mm.	28.0
9	32mm.	32.0
10	35mm.	35.0

Please refer to ACROFLEX Standard

OK Cancel

Picture No.43 : Required nominal & actual ID of insulation tube already filled in.

Insulation Size

Sheet | ID of Insulation Tube | Insulation Tube Actual Thickness

Input Actual Thickness of Insulation Tube


Thickness	ID of Insulation Tube					
	6mm.	10mm.	13mm.	16mm.	19mm.	22mm.
3mm.	3	3	3	3	3	3
6mm.	6	6	6	6	6	6
10mm.	10	10	10	10	10	10
13mm.	13	13	13	13	13	13
20mm.	20	20	20	20	20	20
25mm.	25	25	25	25	25	25
32mm.	32	32	32	32	32	32
38mm.	38	38	38	38	38	38
44mm.	44	44	44	44	44	44
50mm.	50	50	50	50	50	50
56mm.	56	56	56	56	56	56
63mm.	63	63	63	63	63	63

Please refer to ACROFLEX Standard

OK Cancel

Picture No.44 : Actual insulation thickness of tube.

 **INSULATION COST**



The insulation cost for insulating hot & cold water pipes vary directly with size of the pipes and the thickness of insulation. When entering the insulation cost, do not forget to add in the cost for installation. After entering all necessary information, click  (see picture no.45). AEROFLEX Program will save the costing data for calculation the overall cost, i.e. calculation of Economic & Prevent Condensation Thickness Recommendation (see picture no.46).

Insulation Cost

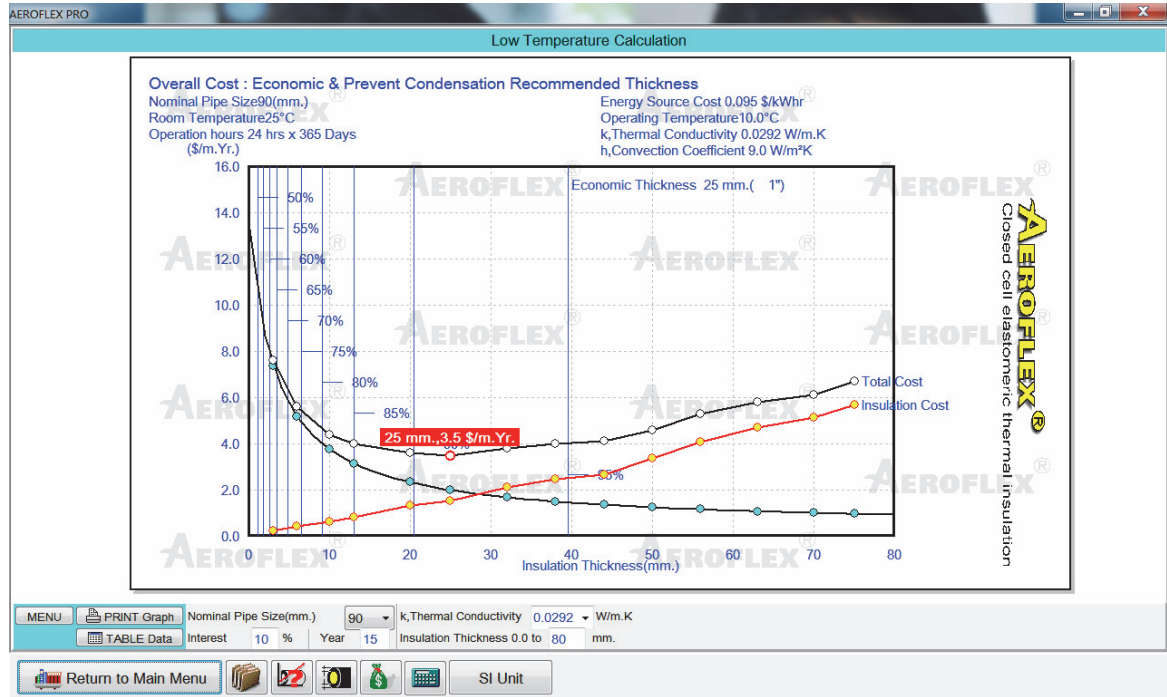
Insulation and Installation Cost Table(\$/m.)

IPS Copper Pipe Sheet

Insulation Thickness	Nominal Pipe Size					
	6	10	13	16	19	25
3 mm.( 1/8")	0.35	0.42	0.49	0.51	0.53	0.70
6 mm.( 1/4")	0.44	0.53	0.62	0.64	0.66	0.88
10 mm.( 3/8")	0.66	0.80	0.93	0.97	1.00	1.33
13 mm.( 1/2")	0.88	1.06	1.24	1.30	1.33	1.77
20 mm.( 3/4")	1.52	1.83	2.14	2.21	2.29	3.05
25 mm.( 1")	1.89	2.27	2.65	2.74	2.84	3.78
32 mm.(1-1/4")	2.60	3.13	3.65	3.78	3.91	5.21
38 mm.(1-1/2")	4.17	5.01	5.85	6.05	6.26	8.35
44 mm.(1-3/4")	5.28	6.34	7.39	7.65	7.92	10.56
50 mm.( 2")	5.72	6.86	8.00	8.27	8.57	11.43
56 mm.(2-1/4")	8.22	9.86	11.50	11.90	12.32	16.43
63 mm.(2-1/2")	9.80	11.76	13.72	14.21	14.70	19.60
70 mm.(2-3/4")	11.11	13.33	15.55	16.11	16.67	22.22
75 mm.( 3")	11.54	13.85	16.16	16.74	17.31	23.08
100 mm.( 4")	19.10	22.92	26.74	27.70	28.65	38.20

Remark \$/m.  

Picture No.45 : Required total insulation costs including installation cost already filled in.



Picture No.46 : Calculation result of Economic & Prevent Condensation Thickness Recommendation of AEROFLEX closed cell elastomeric thermal insulation.