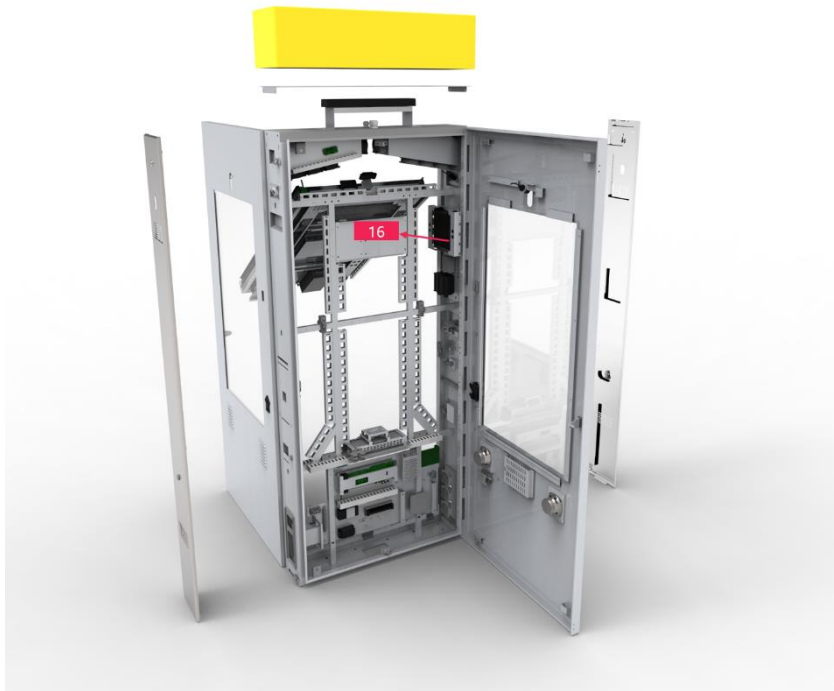


Thermal Management Report

SOLIDWORKS Flow Simulation



NISDK-550PCT-305-DFW

55" SmartCities Kiosk
Weather condition: Dallas, Texas

May 1, 2020

By Nanov Research and Development Center
Brooklyn, New York

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1 General Information

Objective of the simulation: => Update

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1.1 Analysis Environment

Software Product: Flow Simulation 2019 SP5.0. Build: 4725
CPU Type: Intel(R) Core(TM) i7-9850H CPU @ 2.60GHz
CPU Speed: 2592 MHz
RAM: 32575MB / 134217727MB
Operating System: Windows 10 (or higher) (Version 10.0.18363)

1.2 Model Information

Model Name: 01-FLOW_55Inches_3DFile.SLDASM
Project Name: FLOW_Outside Flow-mod

1.3 Project Comments:

Unit System: SI (m-kg-s)
Analysis Type: External (not exclude internal spaces)

1.4 Size of Computational Domain

Size

| | |
|--------|----------|
| X min | -1.150 m |
| X max | 1.400 m |
| Y min | -0.650 m |
| Y max | 0.650 m |
| Z min | -0.250 m |
| Z max | 0.250 m |
| X size | 2.550 m |
| Y size | 1.300 m |
| Z size | 0.500 m |

1.5 Simulation Parameters

1.5.1 Mesh Settings

1.5.1.1 Basic Mesh

Basic Mesh Dimensions

| | |
|----------------------|----|
| Number of cells in X | 60 |
| Number of cells in Y | 32 |
| Number of cells in Z | 8 |

Fluid Flow Simulation Report

1.5.1.2 Analysis Mesh

Total Cell count: 4732744
Fluid Cells: 3076601
Solid Cells: 1656143
Partial Cells: 1343040
Trimmed Cells: 26390

1.5.1.3 Additional Physical Calculation Options

Heat Transfer Analysis: Heat conduction in solids: On Heat conduction in solids only: Off
Flow Type: Laminar and turbulent
Time-Dependent Analysis: Off
Gravity: On
Radiation: On
Humidity: Off
Default Wall Roughness: 0 micrometer

1.5.2 Material Settings

Material Settings

Fluids

[Air](#)

Solids

[Insulator](#)

[AISI 1020 Steel, Cold Roll Pulled Steel](#)

[ABS](#)

[6061 Alloy](#)

[Glass](#)

[Backlight](#)

1.5.3 Initial Conditions

Ambient Conditions

| | |
|--------------------------|---|
| Thermodynamic parameters | Static Pressure: 101325.00 Pa Temperature: 104.00 °F |
| Velocity parameters | Velocity vector Velocity in X direction: 0 m/s Velocity in Y direction: 0 m/s Velocity in Z direction: 0 m/s |
| Solid parameters | Default material: Insulator Initial solid temperature: 104.00 °F Radiation Transparency: Opaque |
| Turbulence parameters | |

1.5.4 Boundary Conditions

Fans

Internal Fan 01_9000RPM

| | |
|--------------------------|--|
| Type | Internal Fan |
| Fan curve | 1_80X80X38mm |
| | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-2/01-FLOW_[Sunon]80mmFan_DC12v.1-1/ Divide Line2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-2/01-FLOW_[Sunon]80mmFan_DC12v.1-1/ Divide Line2//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 02_9000RPM

| | |
|--------------------------|--|
| Type | Internal Fan |
| Fan curve | 1_80X80X38mm |
| | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-1/01-FLOW_[Sunon]80mmFan_DC12v.1-1/ Divide Line2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-1/01-FLOW_[Sunon]80mmFan_DC12v.1-1/ Divide Line2//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 11_6000RPM

| | |
|-------------------|--|
| Type | Internal Fan |
| Fan curve | 2_80X80X25mm |
| | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-2/01-FLOW_[Sunon]80mmFan_DC12v-1/ Divide Line1//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |

Fluid Flow Simulation Report

| | |
|--------------------------|--|
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-2/01-FLOW_[Sunon]80mmFan_DC12v-1/ Divide Line1//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 12_6000RPM

| | |
|--------------------------|--|
| Type | Internal Fan |
| Fan curve | 2_80X80X25mm |
| | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-2/01-FLOW_[Sunon]80mmFan_DC12v-2/ Divide Line1//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-2/01-FLOW_[Sunon]80mmFan_DC12v-2/ Divide Line1//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 13_6000RPM

| | |
|--------------------------|--|
| Type | Internal Fan |
| Fan curve | 2_80X80X25mm |
| | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-2/01-FLOW_[Sunon]80mmFan_DC12v-3/ Divide Line1//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan assy-2/01-FLOW_[Sunon]80mmFan_DC12v-3/ Divide Line1//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 14_6000RPM

| | |
|-----------|--------------|
| Type | Internal Fan |
| Fan curve | 2_80X80X25mm |

Fluid Flow Simulation Report

| | |
|--------------------------|--|
| | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan Assy-1/01-FLOW_[Sunon]80mmFan_DC12v-3/ Divide Line1//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan Assy-1/01-FLOW_[Sunon]80mmFan_DC12v-3/ Divide Line1//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 15_6000RPM

| | |
|--------------------------|--|
| Type | Internal Fan |
| Fan curve | 2_80X80X25mm |
| | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan Assy-1/01-FLOW_[Sunon]80mmFan_DC12v-2/ Divide Line1//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan Assy-1/01-FLOW_[Sunon]80mmFan_DC12v-2/ Divide Line1//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 16_6000RPM

| | |
|--------------------------|--|
| Type | Internal Fan |
| Fan curve | 2_80X80X25mm |
| | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan Assy-1/01-FLOW_[Sunon]80mmFan_DC12v-1/ Divide Line1//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01-FLOW_Water Duct Assy-1/01-FLOW_Fan Assy-1/01-FLOW_[Sunon]80mmFan_DC12v-1/ Divide Line1//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |

Fluid Flow Simulation Report

| | |
|------------------------|--|
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 21_3000RPM

| | |
|--------------------------|---|
| Type | Internal Fan |
| Fan curve | 3_80X80X25mm (FP-108D) |
| | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON_800mm-1-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-1/ Divide Line11//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON_800mm-1-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-1/ Divide Line11//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 22_3000RPM

| | |
|--------------------------|---|
| Type | Internal Fan |
| Fan curve | 3_80X80X25mm (FP-108D) |
| | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON_800mm-1-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-2/ Divide Line11//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON_800mm-1-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-2/ Divide Line11//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 23_3000RPM

| | |
|-------------------|--|
| Type | Internal Fan |
| Fan curve | 3_80X80X25mm (FP-108D) |
| | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON_80mm-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-1/ Divide Line11//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |

Fluid Flow Simulation Report

| | |
|--------------------------|--|
| Outlet faces | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON 80mm-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-1/ Divide Line11//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 24_3000RPM

| | |
|--------------------------|--|
| Type | Internal Fan |
| Fan curve | 3_80X80X25mm (FP-108D) |
| | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON 80mm-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-2/Divide Line1//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON 80mm-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-2/Divide line1//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Internal Fan 25_3000RPM

| | |
|--------------------------|--|
| Type | Internal Fan |
| Fan curve | 3_80X80X25mm (FP-108D) |
| | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON 80mm-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-3/Divide line1//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Inlet flow vector direction: Normal to face |
| Outlet faces | 01-FLOW_Frame Assy-1/01- FLOW_FAN_SUNON 80mm-1/01- FLOW_[Sunon]80mmFan_DC12v.1.2-3/Divide line1//Face |
| Outlet coordinate system | Face Coordinate System |
| Outlet reference axis | X |
| Outlet flow parameters | Outlet flow vector direction: Normal to face |
| Toggle | On |

Boundary Conditions

Fan_in 01

| | |
|--------------------------------|--|
| Type | Inlet Volume Flow |
| Faces | 01-FLOW_Panel assy-1/01-FLOW_Cross fan-11-2/Boss-Protrusion2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s Fully developed flow: No Inlet profile: 0 |
| Thermodynamic parameters | Approximate pressure: 101325.00 Pa Temperature type: Temperature of initial components Temperature: 104.00 °F |
| Turbulence parameters | Boundary layer parameters |
| Boundary layer type: Turbulent | |

Fan_in 02

| | |
|--------------------------------|--|
| Type | Inlet Volume Flow |
| Faces | 01-FLOW_Panel assy-1/01-FLOW_Cross fan-11-3/Boss-Protrusion2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s Fully developed flow: No Inlet profile: 0 |
| Thermodynamic parameters | Approximate pressure: 101325.00 Pa Temperature type: Temperature of initial components Temperature: 104.00 °F |
| Turbulence parameters | Boundary layer parameters |
| Boundary layer type: Turbulent | |

Fan_in 03

| | |
|--------------------------------|--|
| Type | Inlet Volume Flow |
| Faces | 01-FLOW_Panel assy-2/01-FLOW_Cross fan-11-3/Boss-Protrusion2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s Fully developed flow: No Inlet profile: 0 |
| Thermodynamic parameters | Approximate pressure: 101325.00 Pa Temperature type: Temperature of initial components Temperature: 104.00 °F |
| Turbulence parameters | Boundary layer parameters |
| Boundary layer type: Turbulent | |

Fan_in 04

| | |
|--------------------------------|--|
| Type | Inlet Volume Flow |
| Faces | 01-FLOW_Panel assy-2/01-FLOW_Cross fan-11-2/Boss-Protrusion2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s Fully developed flow: No Inlet profile: 0 |
| Thermodynamic parameters | Approximate pressure: 101325.00 Pa Temperature type: Temperature of initial components Temperature: 104.00 °F |
| Turbulence parameters | Boundary layer parameters |
| Boundary layer type: Turbulent | |

Fan_OUT 01

| | |
|-------------------|--|
| Type | Outlet Volume Flow |
| Faces | 01-FLOW_Panel assy-1/01-FLOW_Cross fan-11-2/Boss-Protrusion2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s |

Fan_OUT 02

| | |
|-------------------|--|
| Type | Outlet Volume Flow |
| Faces | 01-FLOW_Panel assy-1/01-FLOW_Cross fan-11-3/Boss-Protrusion2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s |

Fan_OUT 03

| | |
|-------------------|--|
| Type | Outlet Volume Flow |
| Faces | 01-FLOW_Panel assy-2/01-FLOW_Cross fan-11-3/Boss-Protrusion2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s |

Fan_OUT 04

| | |
|-------------------|--|
| Type | Outlet Volume Flow |
| Faces | 01-FLOW_Panel assy-2/01-FLOW_Cross fan-11-2/Boss-Protrusion2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |

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| | |
|-----------------|--|
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s |
|-----------------|--|

Outlet Volume Flow 1

| | |
|-------------------|--|
| Type | Outlet Volume Flow |
| Faces | 01-FLOW_Frame Assy-1/01-FLOW_Heater assy-1/01-FLOW_Cross fan-11-1/Boss-Protrusion2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s |

Outlet Volume Flow 2

| | |
|-------------------|---|
| Type | Outlet Volume Flow |
| Faces | 01- FLOW_Frame Assy-1/01-FLOW_Heater assy-1/01-FLOW_Cross fan-11-2/Boss Protrusion 02- 2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s |

Inlet volume flow 1

| | |
|--------------------------------|--|
| Type | Inlet Volume Flow |
| Faces | 01-FLOW_Frame Assy-1/01-FLOW_Heater assy-1/01-FLOW_Cross fan-11-1/Boss-Protrusion 2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s Fully developed flow: No Inlet profile: 0 |
| Thermodynamic parameters | Approximate pressure: 101325.00 Pa Temperature type: Temperature of initial components Temperature: 104.00 °F |
| Turbulence parameters | Boundary layer parameters |
| Boundary layer type: Turbulent | |

In Flow Volume 2

| | |
|-------------------|--|
| Type | Inlet Volume Flow |
| Faces | 01-FLOW_Frame Assy-1/01-FLOW_Heater assy-1/01-FLOW_Cross fan-11-2/Boss-2//Face |
| Coordinate system | Face Coordinate System |
| Reference axis | X |
| Flow parameters | Flow vectors direction: Normal to face Volume flow rate: 0.0217 m ³ /s Fully developed flow: No |

Fluid Flow Simulation Report

| | |
|--------------------------------|---|
| | Inlet profile: 0 |
| Thermodynamic parameters | Approximate pressure: 101325.00 Pa Temperature type: Temperature of initial components Temperature: 104.00 °F |
| Turbulence parameters | Boundary layer parameters |
| Boundary layer type: Turbulent | |

1.5.5 Volumetric Heat Sources

Heat Volume Sources

Front_01-193W

| | |
|----------------------|--|
| Components | 01-FLOW_Panel assy-2@01- FLOW__55”_3DFile/01-FLOW_55inch Panel- 1@01-FLOW_Panel assy |
| Coordinate system | Global coordinate system |
| Reference axis | X |
| Source type | Heat Generation Rate |
| Heat generation rate | 193.000 W |

Frint_02-193W

| | |
|----------------------|--|
| Components | 01-FLOW_Panel assy-1@01- FLOW__55”_3DFile/01-FLOW_55inch Panel- 1@01-FLOW_Panel assy |
| Coordinate system | Global coordinate system |
| Reference axis | X |
| Source type | Heat Generation Rate |
| Heat generation rate | 193.000 W |

Back_01-288W

| | |
|----------------------|--|
| Components | 01-FLOW_Panel assy-2@01- FLOW__55 인치_3D 파일/01-FLOW_55inch Panel-2@01-FLOW_Panel assy |
| Coordinate system | Global coordinate system |
| Reference axis | X |
| Source type | Heat Generation Rate |
| Heat generation rate | 288.000 W |

Back_02-288W

| | |
|----------------------|--|
| Components | 01-FLOW_Panel assy-1@01- FLOW__55 인치_3D 파일/01-FLOW_55inch Panel-2@01-FLOW_Panel assy |
| Coordinate system | Global coordinate system |
| Reference axis | X |
| Source type | Heat Generation Rate |
| Heat generation rate | 288.000 W |

1.5.6 Engineering Goals

Goals

Global Goals

GG Average Static Pressure 1

| | |
|--------------------|--------------------------|
| Type | Global Goal |
| Goal type | Static Pressure |
| Calculate | Average value |
| Coordinate system | Global coordinate system |
| Criteria | 1.00 Pa |
| Use in convergence | On |

GG Minimum Temperature (Fluid) 1

| | |
|--------------------|--------------------------|
| Type | Global Goal |
| Goal type | Temperature (Fluid) |
| Calculate | Minimum value |
| Coordinate system | Global coordinate system |
| Criteria | -457.87 °F |
| Use in convergence | On |

GG Average Temperature (Fluid) 1

| | |
|--------------------|--------------------------|
| Type | Global Goal |
| Goal type | Temperature (Fluid) |
| Calculate | Average value |
| Coordinate system | Global coordinate system |
| Criteria | -457.87 °F |
| Use in convergence | On |

GG Maximum Temperature (Fluid) 1

| | |
|--------------------|--------------------------|
| Type | Global Goal |
| Goal type | Temperature (Fluid) |
| Calculate | Maximum value |
| Coordinate system | Global coordinate system |
| Criteria | -457.87 °F |
| Use in convergence | On |

GG Average Velocity 1

| | |
|--------------------|--------------------------|
| Type | Global Goal |
| Goal type | Velocity |
| Calculate | Average value |
| Coordinate system | Global coordinate system |
| Criteria | 1.000 m/s |
| Use in convergence | On |

GG Minimum Temperature (Solid) 1

| | |
|-------------------|--------------------------|
| Type | Global Goal |
| Goal type | Temperature (Solid) |
| Calculate | Minimum value |
| Coordinate system | Global coordinate system |

Fluid Flow Simulation Report

| | |
|--------------------|------------|
| Criteria | -457.87 °F |
| Use in convergence | On |

GG Average Temperature (Solid) 1

| | |
|--------------------|--------------------------|
| Type | Global Goal |
| Goal type | Temperature (Solid) |
| Calculate | Average value |
| Coordinate system | Global coordinate system |
| Criteria | -457.87 °F |
| Use in convergence | On |

GG Maximum Temperature (Solid) 1

| | |
|--------------------|--------------------------|
| Type | Global Goal |
| Goal type | Temperature (Solid) |
| Calculate | Maximum value |
| Coordinate system | Global coordinate system |
| Criteria | -457.87 °F |
| Use in convergence | On |

1.6 Analysis Time

Calculation Time: 108370 s
Number of Iterations: 527
Warnings: Condition: Internal Fan 16_6000RPM

2 Results

2.1 Analysis Goals

Goals

| Name | Unit | Value | Progress | Criteria | Delta | Use in convergence |
|----------------------------------|------|-----------|----------|---------------|---------------|--------------------|
| GG Average Static Pressure 1 | Pa | 101371.96 | 100 | 1.80693067 | 0.889555508 | On |
| GG Minimum Temperature (Fluid) 1 | °F | 103.98 | 100 | 0.0941506303 | 0.00405375664 | On |
| GG Average Temperature (Fluid) 1 | °F | 110.62 | 100 | 0.184007597 | 0.182200689 | On |
| GG Maximum Temperature (Fluid) 1 | °F | 171.19 | 100 | 1.77617646 | 0.485802891 | On |
| GG Average Velocity 1 | m/s | 0.369 | 100 | 0.00903138354 | 0.00184366252 | On |
| GG Minimum Temperature (Solid) 1 | °F | 104.15 | 100 | 0.101293903 | 0.0399225957 | On |
| GG Average Temperature (Solid) 1 | °F | 141.62 | 100 | 1.08100191 | 0.379475107 | On |
| GG Maximum Temperature (Solid) 1 | °F | 171.66 | 100 | 1.78608822 | 0.468452028 | On |

2.2 Global Min-Max-Table

Min/Max Table

| Name | Minimum | Maximum |
|--------------------------------------|-----------|-----------|
| Density (Fluid) [kg/m ³] | 1.01 | 1.16 |
| Density (Solid) [kg/m ³] | 1020.00 | 7870.00 |
| Pressure [Pa] | 100993.03 | 107651.57 |
| Temperature [°F] | 103.98 | 171.66 |
| Temperature (Fluid) [°F] | 103.98 | 171.19 |
| Temperature (Solid) [°F] | 104.15 | 171.66 |
| Velocity [m/s] | 0 | 25.082 |
| Velocity (X) [m/s] | -21.890 | 22.260 |

Fluid Flow Simulation Report

| | | |
|--|-------------|---------------|
| Velocity (Y) [m/s] | -17.995 | 17.095 |
| Velocity (Z) [m/s] | -22.067 | 22.253 |
| Aspect Ratio CV [] | 1.0020668 | 39618.4596236 |
| Gap Size [m] | 3.064e-04 | 1.963 |
| Normal (X) [] | -1.0000000 | 1.0000000 |
| Normal (Y) [] | -1.0000000 | 1.0000000 |
| Normal (Z) [] | -1.0000000 | 1.0000000 |
| Wall Distance [m] | 0.001 | 0.186 |
| Axial Velocity [m/s] | -22.067 | 22.253 |
| Circumferential Velocity [m/s] | -18.187 | 17.363 |
| Lambda2-Criterion [1/s ²] | -2906688.59 | 1444386.43 |
| Mach Number [] | 0 | 0.07 |
| Normal Velocity [m/s] | -25.082 | 25.082 |
| Radial Velocity [m/s] | -21.391 | 22.857 |
| Relative Velocity (M*) [] | 0 | 0.0764216 |
| Tangential Velocity [m/s] | 0 | 25.082 |
| Velocity RRF [m/s] | 0 | 25.082 |
| Velocity RRF (X) [m/s] | -21.890 | 22.260 |
| Velocity RRF (Y) [m/s] | -17.995 | 17.095 |
| Velocity RRF (Z) [m/s] | -22.067 | 22.253 |
| Vorticity [1/s] | 0 | 8252.69 |
| Vorticity (X) [1/s] | -4283.74 | 3765.52 |
| Vorticity (Y) [1/s] | -6566.71 | 2707.00 |
| Vorticity (Z) [1/s] | -3925.45 | 6171.08 |
| Dynamic Pressure [Pa] | 0 | 345.90 |
| Friction Coefficient [] | 0 | 29692.5432 |
| Reference Density [kg/m ³] | 1.01 | 1.16 |
| Reference Pressure [Pa] | 101325.00 | 101325.00 |
| Reference Velocity [m/s] | 0 | 23.892 |
| Relative Pressure [Pa] | -331.97 | 6326.57 |
| Shear Stress [Pa] | 0 | 6.29 |
| Shear Stress (X) [Pa] | -2.66 | 3.64 |
| Shear Stress (Y) [Pa] | -6.27 | 3.19 |
| Shear Stress (Z) [Pa] | -3.10 | 3.69 |
| Total Pressure [Pa] | 100993.03 | 107651.57 |
| Dynamic Viscosity [Pa*s] | 1.9091e-05 | 2.0771e-05 |
| Fluid Thermal Conductivity [W/(m*K)] | 0.0273 | 0.0299 |
| Prandtl Number [] | 0.6956918 | 0.7039121 |
| Solid Thermal Conductivity (X) [W/(m*K)] | 0.2256 | 170.0000 |
| Solid Thermal Conductivity (Y) [W/(m*K)] | 0.2256 | 170.0000 |
| Solid Thermal Conductivity (Z) [W/(m*K)] | 0.2256 | 170.0000 |
| Sonic Speed [m/s] | 354.572 | 374.952 |
| Specific Heat (Cp) [J/(kg*K)] | 1007.7 | 1009.9 |
| Specific Heat (Solid) [J/(kg*K)] | 486.0 | 1386.0 |
| Stagnation Density [kg/m ³] | 1.01 | 1.16 |
| Absolute Total Enthalpy [J/kg] | 318103.630 | 355760.725 |

Fluid Flow Simulation Report

| | | |
|---|--------------|-------------|
| Adiabatic Fluid Temperature [°F] | 103.99 | 166.18 |
| Bottleneck Number [] | 0 | 1.0000000 |
| Heat Flux (X) [W/m ²] | -593407.694 | 18890.273 |
| Heat Flux (Y) [W/m ²] | -94523.504 | 67922.882 |
| Heat Flux (Z) [W/m ²] | -23636.541 | 27942.422 |
| Heat Transfer Coefficient [W/m ² /K] | 0 | 562.344 |
| Heat Transfer Coefficient (Adiabatic Temperature) [W/m ² /K] | 0 | 7.615e+09 |
| Overheat above Melting Temperature [K] | -9686.766 | -9649.261 |
| Reference Fluid Temperature [°F] | 104.00 | 104.00 |
| ShortCut Number [] | 0 | 1.0000000 |
| Stanton Number [] | -3.3427 | 4.4633 |
| Surface Heat Flux [W/m ²] | -32179.357 | 32179.357 |
| Surface Heat Flux (Conductive) [W/m ²] | -32179.357 | 32179.357 |
| Surface Heat Flux (Convective) [W/m ²] | -3115272.342 | 3012153.898 |
| Total Temperature [°F] | 104.00 | 171.19 |
| Wall Temperature [°F] | 104.02 | 171.19 |
| Incident Radiant Flux [W/m ²] | 0 | 554001.148 |
| Incident Radiant Flux (solar) [W/m ²] | -1.324e-15 | 1305.523 |
| Incident Radiant Flux (thermal) [W/m ²] | 0 | 554001.148 |
| Leaving Radiant Flux [W/m ²] | 391.173 | 188725.956 |
| Leaving Radiant Flux (solar) [W/m ²] | -4.503e-16 | 1305.523 |
| Leaving Radiant Flux (thermal) [W/m ²] | 391.173 | 188725.956 |
| Net Radiant Flux [W/m ²] | -365275.192 | 391.293 |
| Net Radiant Flux (solar) [W/m ²] | -858.598 | 8.741e-16 |
| Net Radiant Flux (thermal) [W/m ²] | -365275.192 | 391.293 |
| Turbulence Intensity [%] | 1.73e-10 | 1000.00 |
| Turbulence Length [m] | 0 | 0.042 |
| Turbulent Dissipation [W/kg] | 2.97e-23 | 1092827.76 |
| Turbulent Energy [J/kg] | 0 | 18.481 |
| Turbulent Time [s] | 0 | 135635.830 |
| Turbulent Viscosity [Pa*s] | 0 | 0.0046 |
| Boundary Layer Thickness [m] | 6.410e-05 | 0.910 |
| Boundary Layer Thickness (Thermal) [m] | 9.275e-05 | 0.910 |
| Boundary Layer Type [] | 0 | 1.0000000 |
| Thin Channel Mode [] | 0 | 1 |
| Acoustic Power [W/m ³] | 0 | 7.165e-06 |
| Acoustic Power Level [dB] | 0 | 68.55 |

3 Appendix

3.1 Material Data

Engineering Database

Gases

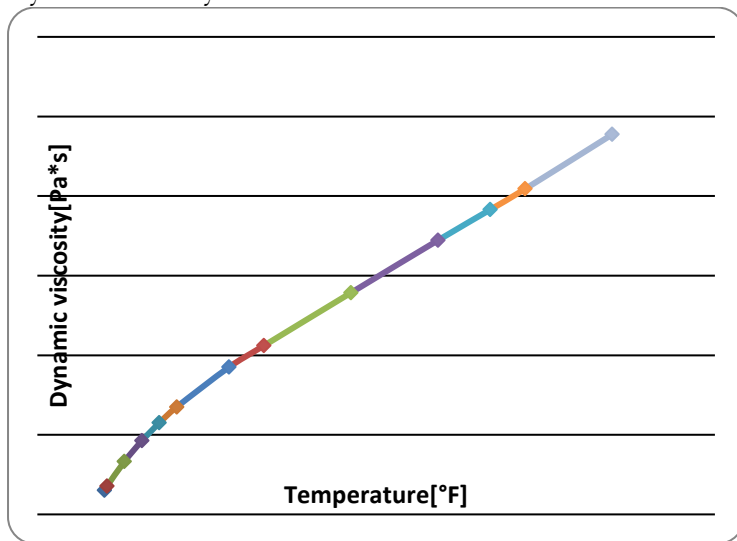
Air

Path: Gases Pre-Defined

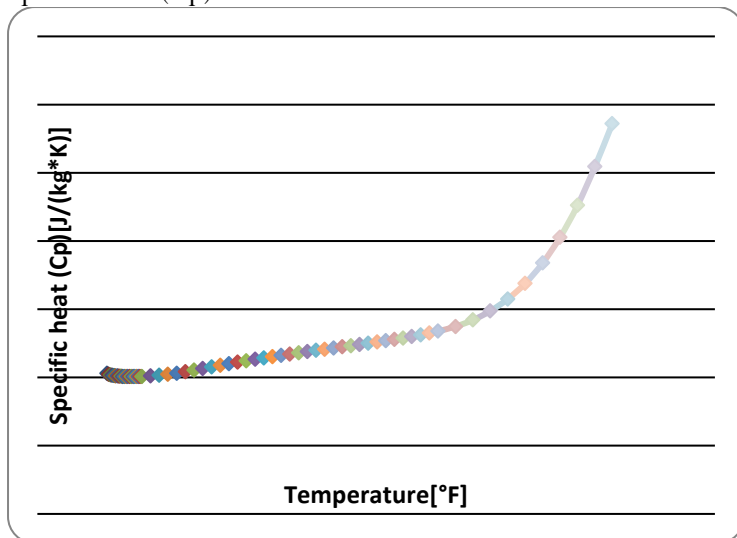
Specific heat ratio (C_p/C_v): 1.399

Molecular mass: 0.0290 kg/mol

Dynamic viscosity

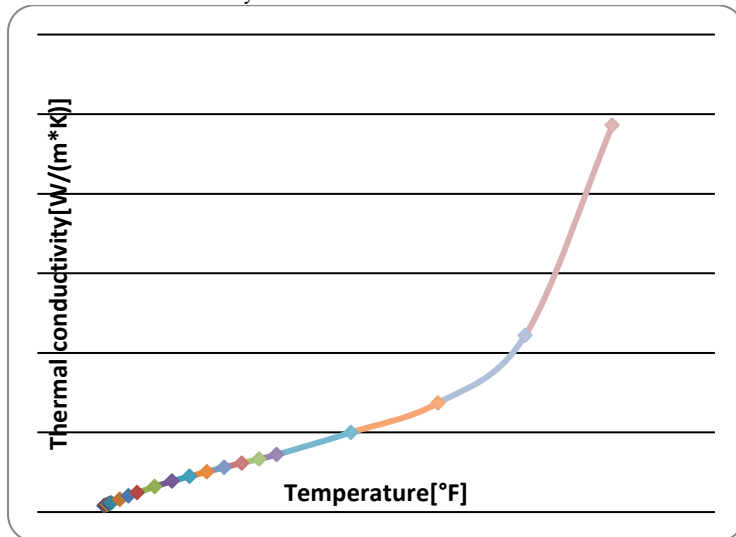


Specific heat (C_p)



Fluid Flow Simulation Report

Thermal conductivity



Solids

Insulator

Path: Solids Pre-Defined\Glasses and Minerals

Density: 1000.00 kg/m³

Specific heat: 1000.0 J/(kg*K)

Conductivity type: Isotropic

Thermal conductivity: 0 W/(m*K)

Electrical conductivity: Dielectric

Radiation properties: No

Melting temperature: Yes

Temperature: -461.47 °F

AISI 1020 Steel, Cold Rolling steel

Path: Solids User Defined\01-FLOW__55”_3D file.SLDASM\basic

Density: 7870.00 kg/m³

Specific heat: 486.0 J/(kg*K)

Conductivity type: Isotropic

Thermal conductivity: 51.9000 W/(m*K)

Electrical conductivity: Dielectric

Radiation properties: No

Melting temperature: No

ABS

Path: Solids User Defined\01-FLOW__55”_3DFile.SLDASM\Base

Density: 1020.00 kg/m³

Specific heat: 1386.0 J/(kg*K)

Conductivity type: Isotropic

Thermal conductivity: 0.2256 W/(m*K)

Electrical conductivity: Dielectric

Radiation properties: No

Melting temperature: No

6061 Alloy

Path: Solids User Defined\01-FLOW__55”_3DFile .SLDASM\Base

Density: 2700.00 kg/m³

Fluid Flow Simulation Report

Specific heat: 1300.0 J/(kg*K)
Conductivity type: Isotropic
Thermal conductivity: 170.0000 W/(m*K)
Electrical conductivity: Dielectric
Radiation properties: No
Melting temperature: No

Glass

Path: Solids User Defined\01-FLOW__55 Inches_3DFile .SLDASM\Base
Density: 2457.60 kg/m³
Specific heat: 834.6 J/(kg*K)
Conductivity type: Isotropic
Thermal conductivity: 0.7498 W/(m*K)
Electrical conductivity: Dielectric
Radiation properties: No
Melting temperature: No

Backlight

Path: Solids User Defined\01-FLOW__55Inches_3DFile.SLDASM\Base
Density: 2457.60 kg/m³
Specific heat: 834.6 J/(kg*K)
Conductivity type: Isotropic
Thermal conductivity: 3.0000 W/(m*K)
Electrical conductivity: Dielectric
Radiation properties: No
Melting temperature: No

