

Multidisciplinary analysis solution for optimum design

midas NFX 2018R1 Release Note



midas NFX Release Note 2018 R1

Major Improvements

Midas NFX is an integrated finite element analysis program for structural, CFD simulation and optimization design. It provides efficient and accurate analysis together with an integrated pre-post processor, developed by senior mechanical engineers with over 20 years of CAE software development expertise.

The 2018 version of midas NFX contains several improvements for easier and faster meshing, it includes improvements for fatigue analysis, CFD boundary condition definition and post-processing tools.



Random Vibration Fatigue analysis

〈 Purpose〉

Random vibration analysis is widely used to analyze the response of a structure to random vibrations transmitted through vehicles such as automobiles and railways and airplanes. When the random vibration is continuously generated, the fatigue life evaluation is required accordingly.



Random Vibration Fatigue analysis workflow

{ Workflow process>

In the random vibration fatigue analysis, tensile input and frequency density function moment must be selected according to the procedure of Step 1 and 2 before the random vibration analysis.

After the random vibration analysis, you can follow the steps below for each analysis case.

Step 1	Material
Tensile Strength input	Image: Second
	Enter the value corresponding to the allowable stress for the material used for fatigue analysis in the "Tensile" field.



Random Vibration Fatigue analysis





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Random Vibration Fatigue analysis

Stop E	Fatique Analysis SN using load history
step 5	EN using load history
Fatigue	Analysis bata Siv using stress history EN using stress history
Analysis	Method Vibration Fatigue using Random LC
	Analysis Set Random Analysis
	Stress Option Random type Analysis Set selection
	Stress Type Equivalent (Von Mises)
	Average Max Min Define Fatigue Property
	Property Material Aluminum Alloy
	Define Property Yield Strength 45000 Ibf/in2 Tancia Strength 45000 Ibf/in2
	Analysis technique
	Narrow Steinberg Dirlik Endurance Limit 7500 lbf/in ²
	Output Request
	Damage Fatigue Life Cycle Add Update Delete
	No Material Type
	Duration 1000
	Infinite Life 1e+009 Specify material fatigue data.
	After input, click "Add" to comple
	the definition.
	T – exposure time duration (it follows the time unit defined by user)
	(it follows the time time defined by user)
	Ex : The beam is exposed to random vibration load for
	16-17 minutes. Selected unit [sec]; Input: 1000 [sec]
	Frequency domain analysis methods:
	1)Narrow Band
	: Assumes that the stress ranges are distributed as the Rayleigh
	distributed peaks of the limiting narrowband process.
	2)Steinherg
	- Accuracy that PSD function follows Gaussian distribution and no
	stress cycles occur with ranges greater than 6 sigma RMS
	stress cycles occur with ranges greater than 6 sigma RMS.
	stress cycles occur with ranges greater than 6 sigma RMS. Used commonly in electronic industry.
	 Assumes that FSD function follows Gaussian distribution and no stress cycles occur with ranges greater than 6 sigma RMS. Used commonly in electronic industry. 3)Dirlik Mathed uses empirical closed form supression for Probability.
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	 Assumes that FSD function follows Gaussian distribution and no stress cycles occur with ranges greater than 6 sigma RMS. Used commonly in electronic industry. 3)Dirlik Method uses empirical closed-form expression for Probability Density Function of stress amplitude, based on the Monte Carlo technology. General purpose.
	 Assumes that FSD function follows Gaussian distribution and no stress cycles occur with ranges greater than 6 sigma RMS. Used commonly in electronic industry. 3)Dirlik Method uses empirical closed-form expression for Probability Density Function of stress amplitude, based on the Monte Carlo technology. General purpose. [Tip]
	 Assumes that FSD function follows Gaussian distribution and no stress cycles occur with ranges greater than 6 sigma RMS. Used commonly in electronic industry. 3)Dirlik Method uses empirical closed-form expression for Probability Density Function of stress amplitude, based on the Monte Carlo technology. General purpose. [Tip] Use all methods and select most conservative result.

Random Vibration Fatigue analysis



[DATA] Random Analysis_Fatigue Results, Narrow, [UNIT] lbf, in

Fatigue Analysis

<Purpose>

'Soderberg', 'Morrow', and 'SWT' have been developed according to customer's requests for more various methods in the existing developed mean stress correction techniques. You can also use the 'Fatigue Contribution' function in the output to analyze fatigue analysis results.

Fatigue Analysis	
Analysis Data	
Method SN using load history	
Analysis Set 1	
Stress Option	V None
Stress Type Equivalent (Von Mises)	σ_a, σ_m
Average	Goodman $\frac{\sigma'_e}{\sigma'_e} + \frac{\sigma_u}{\sigma'_u} = 1$
Quick Counting: Number of Stress Ranges	Gerber $\frac{\sigma_a}{\sigma'_e} + \left(\frac{\sigma_m}{\sigma_u}\right)^2 = 1$
Property	Soderberg $\frac{\sigma_a}{\sigma'_a} + \frac{\sigma_m}{\sigma_v} = 1$
Define Property	Morrow $\frac{\sigma_a}{\sigma'} + \frac{\sigma_m}{\sigma} = 1$
Mean Stress Correction Image: Construction Image: Constretee Image: Construct	$ S_{ar} = \sqrt{S_a S_{max}} $
Output Request	σ_a : Stress Amplitude
Damage If atigue Life Cycle Contribution of Fatigue	σ_m : Mean Stress
- Fatigue Load	σ_y : Yield Stress
Load/Stress History Define	σ_u : Ultimate Stress
Number of Repetitions 350000	σ_f : True Fracture Stress
	σ_e : Effective Alternating Stress
Infinite Life 1e+009	S_u : Ultimate Strength Stress (NFX: Tensile Strength)
OK Cancel Apply	S_e : Endurance Limit Stress



Fatigue Analysis

Fatigue Analysis	
Analysis Data	
Method SN using load history	
Analysis Set 1	
Stress Option	1) The relationship between the average stress and
Stress Type Equivalent (Von Mises)	the stress amplitude in the fatigue analysis results
	2) When checking fatigue contribution the "Quick
Average Max Min	Counting" is enabled automatically with the default
Quick Counting: Number of Stress Ranges	
32	
Descala	
Property	
Define Property	
Mean Stress Correction	
📝 None 🕼 Goodman 🕼 Gerber	Fatigue Result Analysis
Soderberg Morrow SWT	Analysis Set 1_Fatigue Results
Output Request	Mean stress
Damage Fatigue Life Cycle	Node Number 4/4 Plot
	9986400. Stress counts distribution
Fatigue Load	
Load/stress history Denne	
Number of Repetitions 100000	
To forito Life 1e ±009	
OK Cancel Apply	
	→ ^{**} ⟨0 ₂ **⟨0 ₂ **⟨0 ₂ ** Mean Stress (MPa)
□	
🗐 🚛 1_Fatigue Results : Fatigue Analys.	Relative fotigue domage ratio
+ Fatigue Result Analysis	
in international internationa	
⊕	
FATIGUE LIFECYCLE	
FATIGUE DAMAGE	
	31/2002
FATIGUE DAMAGE	CON-COS CONTROL CONTRO
EATIGUE LIFECYCLE	Mean Stress (MPa)
5 FATIGUE DAMAGE	Close

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Layer Control tool

< Purpose and usage >

New mesh seed control method has been added. This tool creates several layers of mesh around holes for more accurate grasp of stress concentration.



- 1) Number of boundary layers: Specify the number of layers to be offset (minimum value 1)
- 2) Total Boundary Layer Height: Specifies the height of the total number of boundary layers.
- 3) Boundary layer growth ratio: proportionally adjusts the height value as the layer advances when the number of boundary layers is 2 or more
- Ex) When 1 is input, it is represented by the same height. If it is larger than 1, it becomes larger. If it is smaller than 1 a layer is created with increasingly smaller heights.



Layer Growth Rate 1



Layer Growth Rate 1.2



Layer Growth Rate 0.8



CFD: User Defined Function

< Purpose >

When the flow analysis is performed, the results are output only for the pressure, speed, temperature, etc. calculated basically. User-defined functions have been added to allow users to set up additional functions to output results or contours.



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CFD: Uniform Slice Vector

< Purpose >

With the existing vector feature, vectors are displayed according to mesh density. Using the homogenization function of the intersection plane, it draws a uniformly arranged vector independent of the density of the mesh. You can also set the X-direction spacing and the Y-direction spacing differently.





CFD: Streamline saving option

< Purpose>

Due to previous inconvenience with streamlines displaying, now it is possible to create groups of flow patch and save their position for future use.







CFD: "Show unassociated boundaries"

< Purpose>

In the flow analysis, all boundaries of the analysis area must be given boundary conditions. However, if the model is complicated, it is easy to make mistakes that miss the boundary condition input. NFX 2018R1 provides **unspecified boundary detection**, so that you can find faces of the boundary that are free from boundary conditions. This function can be used when using inlet, outlet, and wall conditions frequently used in flow analysis.

Edge Outlet Pace Outlet Name Face Outlet - 1 Object Type Face Selected 8 Object(s) Type Pressure Neumann Pressure P 0 N/m ² None Backflow Control FD BC Set CFD Boundary Set - 1 OK Cance Apply		- Outlat	
Name Face Outlet-1 Object Type Selected 8 Object(s) Type Image: Selected 8 Object(s) Type Image: Selected 8 Object(s) Type Image: Selected 8 Object(s) Type Image: Selected 8 Object(s) Type Image: Selected 8 Object(s) Type Image: Selected 8 Object(s) Imag	dge Outlet Face		
Object Type Face Selected 8 Object(s) Type Pressure Neumann Pressure P 0 N/m ² None Backflow Control FD BC Set CFD Boundary Set-1 OK Cancel Apply	Name Face	Outlet-1	
Type Selected 8 Object(s) Type P P O N/m² None P O N/m² None Backflow Control FD BC Set CFD Boundary Set-1 CK Cancel Apply	Object		
Selected 8 Object(s) Type P Pressure P O N/m ² None P O N/m ² None FD BC Set CFD Boundary Set-1 CFD Boundary Set-1 OK Cancel Apply	Type Face		_
Type Pressure P 0 N/m² None Backflow Control FD BC Set CFD Boundary Set-1 OK Cancel Apply	📄 s	Selected 8 Object(s)	
Pressure P 0 N/m² None P 0 N/m² None Backflow Control FD BC Set CFD Boundary Set-1 CFD Boundary Set-1 Image: CFD Boundary Set-1 OK Cancel Apply	Туре		
Pressure P 0 N/m ² None Backflow Control FD BC Set CFD Boundary Set-1 CFD Boundary Set-1 CFD Boundary Set-1 CFD CAncel Apply	Pressure	Neumann	
P 0 N/m ² None Backflow Control	Pressure		
Backflow Control FD BC Set CFD Boundary Set-1 ▼ € OK Cancel Apply	P	0 N/m ² None	-
FD BC Set CFD Boundary Set-1 CFD Boundary Set-1 CK Cancel Apply	В	Backflow Control	
FD BC Set CFD Boundary Set-1			
	D BC Set	ED Boundary Set-1	
		0 1(0	
		OK Cancel	Арріу
lick the magnifying glass icon on the inlet, outly	ick the magni	ifving glass icon on	the inlet, outlet
nd wall conditions to see the location of the	id wall conditi	ions to see the loca	ation of the



New tool indicates all unassociated faces



Fully defined outlet BC



CFD: BC application

< Purpose>

To improve application of the boundary conditions, which were previously dependent to initial condition setting.

[Turbulence]

The existing method of defining the turbulence characteristics was inconvenient to distinguish the initial condition from the boundary condition because the value was entered in the field definition. The NFX 2018R1 can independently impart turbulence characteristics (turbulent kinetic energy, turbulence length measure) at boundary conditions. It is also possible to apply the function to the turbulent characteristic boundary condition.

Turbulence
Turbulence
Name Turbulence-1 Object
Type Face 💌
Select Object(s)
[Notice] Turbulence boundary conditions can be applied to specified regions using user-defined Turbulence fields.
CFD BC Set CFD Boundary Set-1
OK Cancel Apply

Turbulence	x		
Turbulence	_		
Name Turbulence-1	Turbulence-1		
Object			
Type Face 💌			
Select Object(s)			
Components			
Eddy Kinetic Energy 0 m²/sec² None 🔻			
Eddy Length Scale 0 m None			
CFD BC Set CFD Boundary Set-1			
Cancel Apply			

< midas NFX 2017R1 input >

<midas NFX 2018R1 input>

[Fixed temperature]

Existing NFXs had to use User Defined Field definitions to set a fixed temperature function as the boundary condition. The function was complicated or limited in practical usage.

The NFX 2018R1 improves user convenience by allowing separate functions to apply fixed temperature boundary conditions.

Name Tempera	ature-1
Object	
Type Face	•
📄 s	elect Object(s)
Components	
Temperature	0 [T]
O User Defined Fi	eld

< midas NFX 2017R1 input >

Temperature
Temperature
Name Temperature-1
Object
Type Face 💌
Select Object(s)
Components
T 0 [T] None •
CFD BC Set CFD Boundary Set-1
🐺 🖉 📉 OK Cancel Apply

<midas NFX 2018R1 input>

