SCORG™ Setup for Analysis of Twin Screw Machines with Design Exploration

SCORG™ is the unique design platform for rotary twin screw machines. The tool includes additional modules for designing and editing rotor profiles, executing a basic thermodynamic calculation based on quasi 1D chamber models and generating the deforming working chamber grids for selected commercial CFD solvers.

For more information on the product please visit the website: www.pdmanalysis.co.uk or refer to documentation help.

This guide lists the steps for setting to use Design Exploration Framework with SCORG™. The user is expected to be familiar with screw machines, CFD and SCORG Thermodynamic model in order to be able to use these procedures. It is highly recommended that books on that topic are studied[1][2]

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1 Introduction

During the design of twin screw compressors and expanders, it is required to vary several geometrical and operational variables to achieve best performance for a given operating condition. SCORG has been used for this purpose by setting the initial configuration of the rotors, clearance sizes and then calculating the performance. When design variable is changed, a new project is setup and performance recalculated. All the data collected by this means can

[1] N. Stosic, I.K. Smith, A. Kovacevic Screw Compressor Mathematical Modelling and Performance Calculation, Springer, UK 2005, ISBN-10 3-540-24275-9

[2] A. Kovacevic. N. Stosic, I.K. Smith, Screw Compressor Three Dimensional Computational Fluid Dynamics and Fluid Solid Interaction, Springer, 2006, ISBN 3-540-36302-5

be processed either internally or externally in programs such as MS-Excel which helps to further evaluate machine designs.

SCORG Design Exploration Framework provides an automation approach in the compressor or expander design activity. This is achieved by setting a single project and exploring the effect of design variable changes in the Design Exploration. Entire machine definition from profile parameters, leakage gaps and rotor geometry can be explored. Selected design data can then be further processed for CFD grid generation and CAD export functionality.

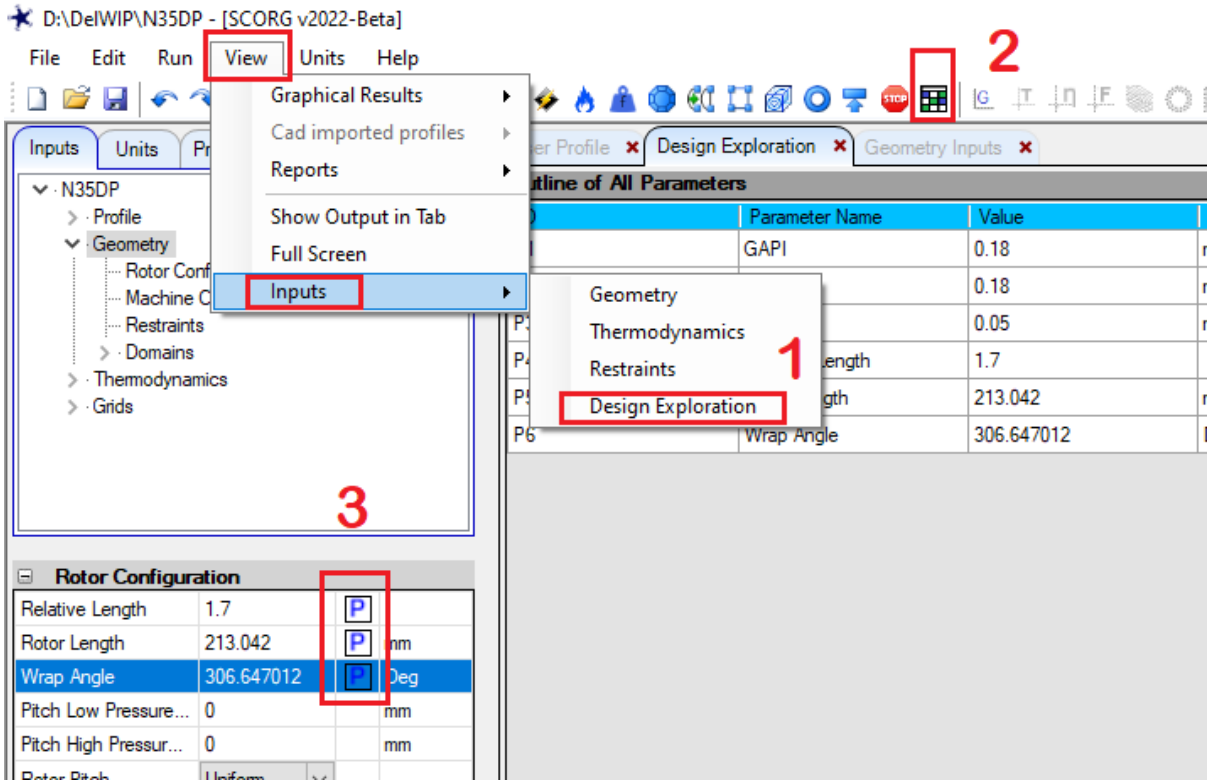
This Tutorial will provide a step-by-step guide for the procedure to use SCORG Design Exploration Framework for analysis of a typical twin-screw compressor, expander, pump or motor simulation. An example of a dry air compressor with 3/5 lobe combination, L/D ratio of 1.7 and wrap angle 285 deg has been considered and three common design scenarios have been setup.

Design Scenario	Description
1	Evaluate sensitivity of clearance gaps
2	Evaluate compressor performance for variation of built-in volume index, rotor length and rotor wrap angle
3	Compressor performance map for variation of built-in volume index, rotor length and rotor wrap angle

The Design Exploration in SCORG can be initiated in three ways.

- Go to View → Inputs → Design Exploration
- Shortcut Icon in main menu
- Define a Parameter in GUI inputs

Each of these will open the Design Exploration tab in the GUI.



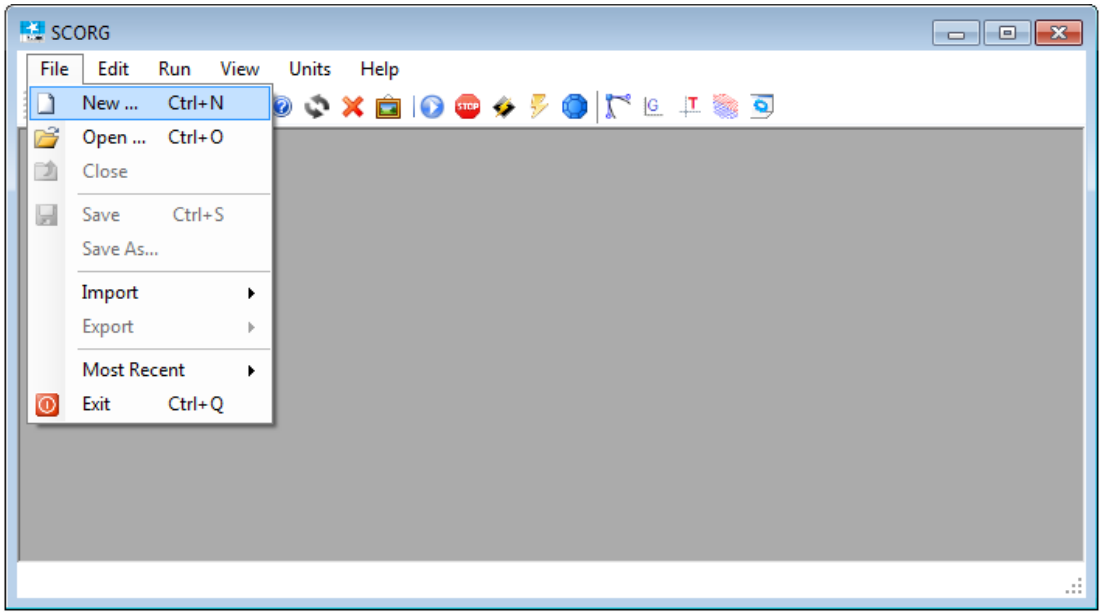
The main steps of design exploration are:

a. Project Parameterisation
b. Design Point definition
c. Design Point Calculation Selection
d. Performance Evaluation

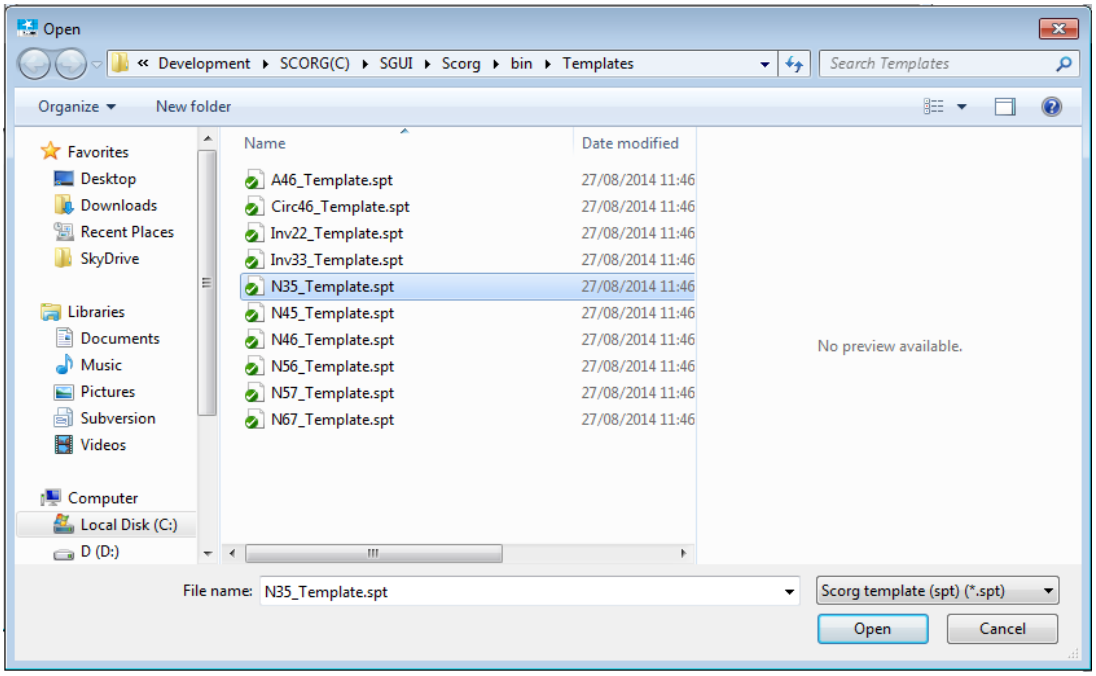
These steps will be described in the considered Design Scenarios in this tutorial. Refer to SCORG Help Manual for more details.

2 Design Scenario 1: Evaluate sensitivity of clearance gaps

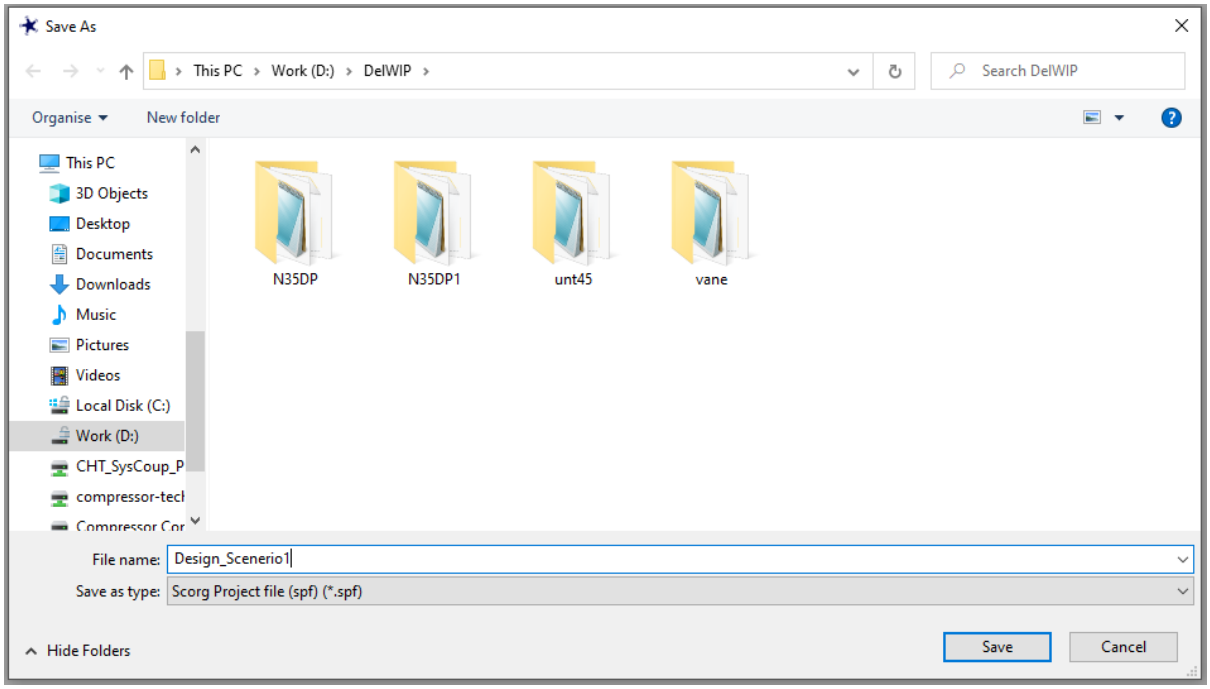
- Launch SCORG™ on the Desktop.
- Select File → New



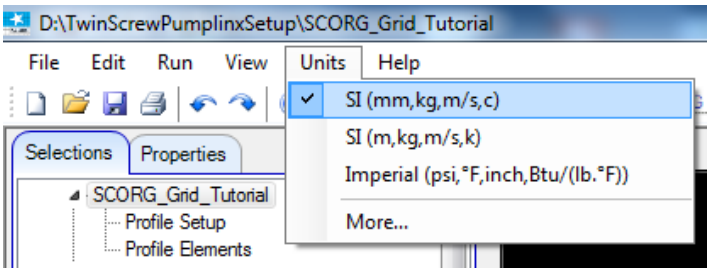
- Select N35_Template.spt → Open



- Save the project in a new folder



- Set Project Units to SI

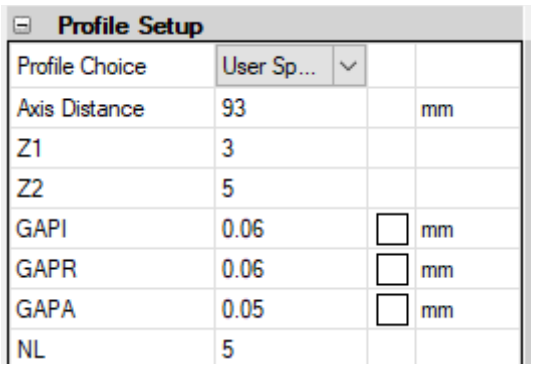


- Set the following Profile Parameters to get desired clearance size:

GAPI = 0.06mm

GAPR = 0.06mm

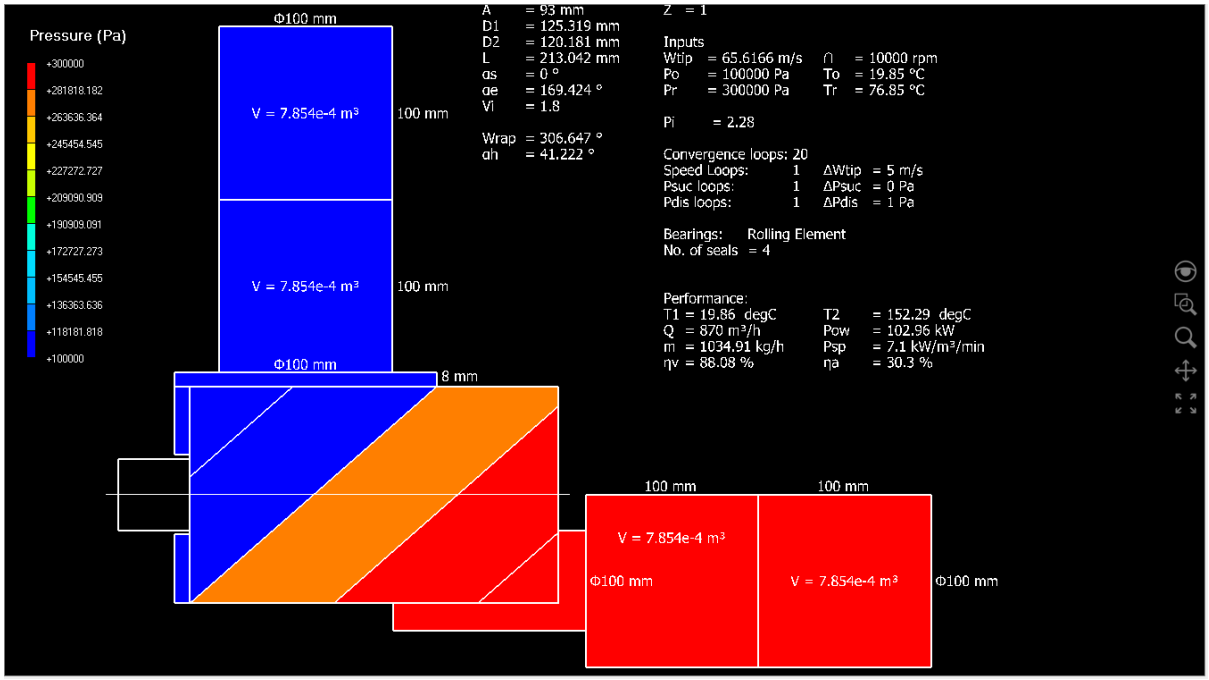
GAPA = 0.05mm



- Go to Thermodynamics → Set the following parameters:

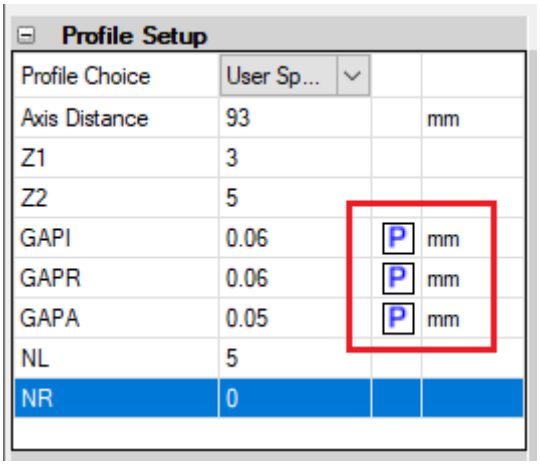
Working Conditions		
Wtip	66.6665	m/s
Rotor Speed	10000	RPM
P0	100000	Pa
Pr	300000	Pa
T0	293	K
Tr	350	K
Tevp	268	K
Tcond	313	K
T Ambient	293	K
Ts	0	K
X	1	

- Save the Project.
- Run Geometry and Thermodynamics
- Inspect the performance data



```
T1     = 19.86 degC      T2     = 152.29 degC
P1     = 1     bar       P2     = 3      bar
Moil   = 0     kg/s      Toil   = 36.86  degC
                         Poil   = 3      bar

Volume Index Vi          = 1.8
Pressure Ratio Pi        = 2.28
Speed                    = 10000 rpm
Tip speed                = 65.62 m/s

Volume flow rate         = 14.5    m3/min
                         = 870     m3/h
Mass flow rate           = 1034.91 kg/h
Volumetric efficiency    = 88.08   %

Power (excl. gearbox)    = 102.96  kW
                         = 138.07  HP
Specific power           = 7.1     kW/m3/min
Adiabatic efficiency     = 30.3    %

Theoretical mass flow    = 1174.96 kg/h
Discharge mass flow      = 1034.91 kg/h
```

- Design Exploration: Set GAPI, GAPR and GAPA as parameters



- Update Design Point data as below

Table of Design Points

	Name	P1 - GAPI	P2 - GAPR	P3 - GAPA
	Units	mm	mm	mm
⚡	DP0 (Current)	0.06	0.06	0.06
⚡	DP1	0.12	0.06	0.06
⚡	DP2	0.18	0.06	0.06
⚡	DP3	0.06	0.12	0.06
⚡	DP4	0.06	0.18	0.06
⚡	DP5	0.06	0.06	0.12
⚡	DP6	0.06	0.06	0.18
▸*				

Each gap size has been increased by 2x and 3x times for a constant value of the other gaps.

- Select Calculations of Geometry and Thermodynamics

Design Point Calculation Selection

ID	Calculation	Options	On/Off
1	*Generate Profile*	*User Specified Profile*	
2	Geometry	Screw Compressor	☑
3	Thermodynamics		☑
4	Force		☐
5	Grid - Rack	Off	☐
6	*Grid - Boundary*	*Casing to Rotor Nonconformal*	
7	*Grid - Rotor2D*		
8	Grid - Ports	Axial	☐
9	*Grid - CFDPreprocessor*	*Off*	
	Vertex Files Start Number	*1*	
	Vertex Files End Number	*40*	
10	Export CAD	STEP Format	☐

- Right-Click DP table and Update All Design Points

Table of Design Points

	Name	P1 - GAPI	P2 - GAPR	P3 - GAPA
	Units	mm	mm	mm
⚡	DP0 (Current)	0.06	0.06	0.06
⚡	DP1	0.12	0.06	0.06
⚡	DP2	0.18	0.06	0.06
⚡	DP3			0.06
⚡	DP4			0.06
⚡	DP5			0.12
⚡	DP6			0.18
▶*				

Set as Current Design Point
Update Design Point
Clear Output of Design Point
Save Design Point As
Delete Design Point
Update All Design Points
Clear Output of All Design Points
Delete All Design Points

On completion of the calculations, the status icons will indicate an up-to-date result.

Table of Design Points

	Name	P1 - GAPI	P2 - GAPR	P3 - GAPA
	Units	mm	mm	mm
✓	DP0 (Current)	0.06	0.06	0.06
✓	DP1	0.12	0.06	0.06
✓	DP2	0.18	0.06	0.06
✓	DP3	0.06	0.12	0.06
✓	DP4	0.06	0.18	0.06
✓	DP5	0.06	0.06	0.12
✓	DP6	0.06	0.06	0.18
*				

- Review the performance data

Design Point Performance Data (Click variable name to sort performance data)

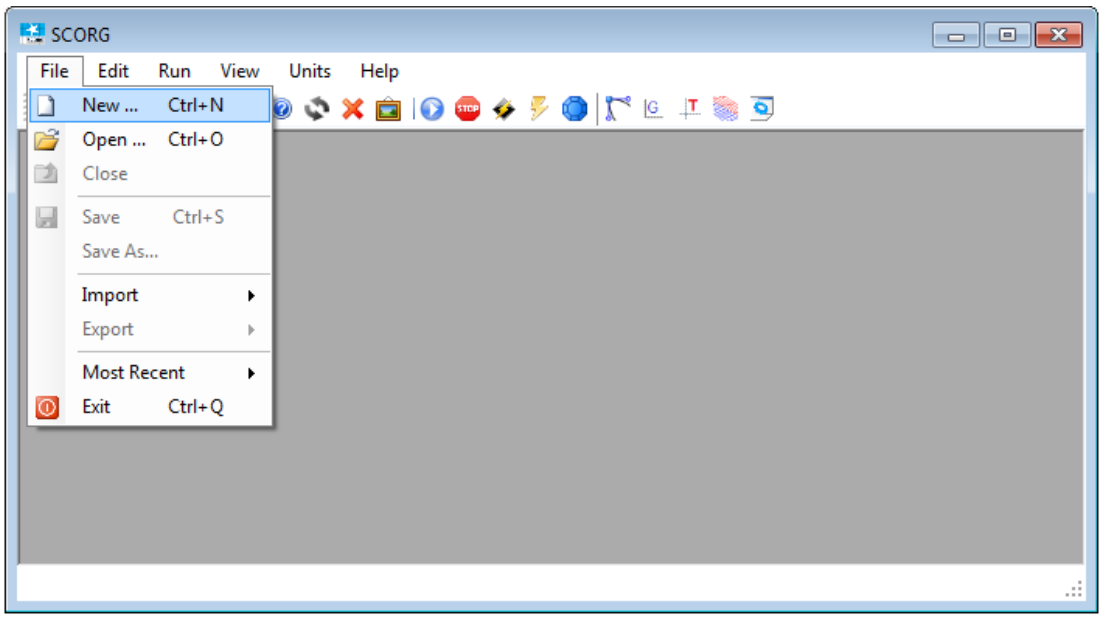
N[rpm]	Psuc[bar]	Pdis[bar]
10000	1	3

	DP	WTP	N	Q	Qn	M	ηv	Powe
	Units	m/s	RPM	m3/m	nm3/m	kg/min	_	Kw
✓	DP0	65.62	10000	14.48	14.488	17.22	0.8793	103.0
✓	DP1	65.62	10000	13.304	13.31	15.82	0.8079	102.4
✓	DP2	65.62	10000	12.1	12.107	14.39	0.7348	101.8
✓	DP3	65.62	10000	13.858	13.865	16.479	0.8415	105.5
✓	DP4	65.62	10000	13.138	13.145	15.624	0.7978	107.8
✓	DP5	65.62	10000	14.334	14.341	17.046	0.8704	103.5
✓	DP6	65.62	10000	14.184	14.191	16.867	0.8613	103.9
*								

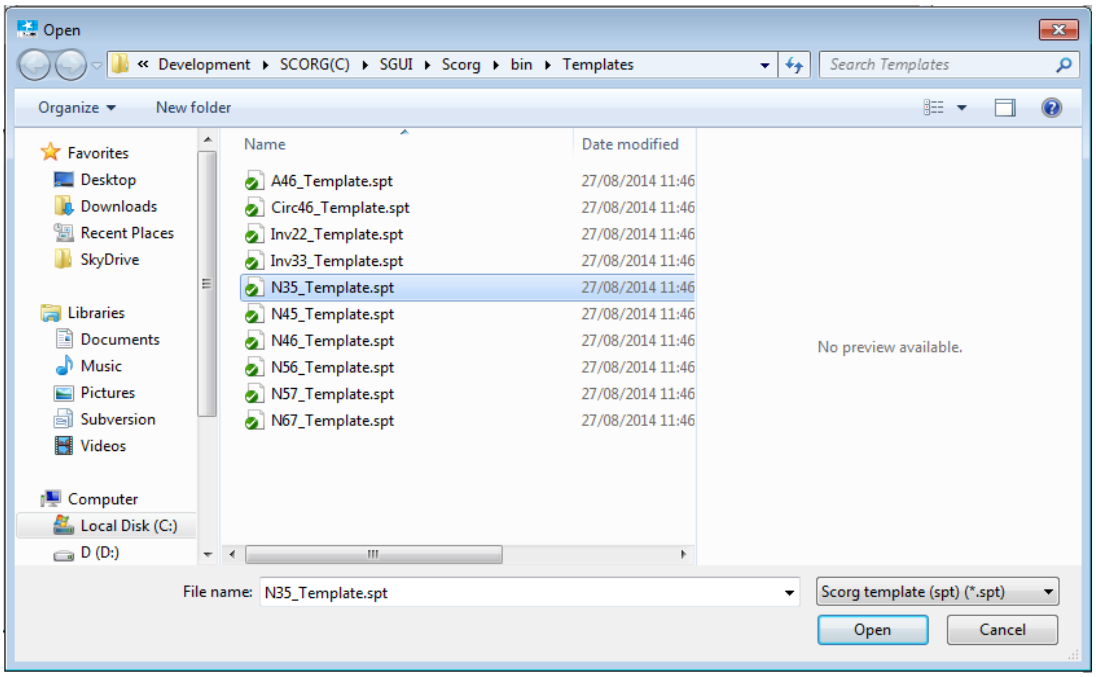
- It can be seen from the volumetric efficiency data that the sensitivity of GAPI is highest and GAPA is the least for this compressor design at the given operating condition.

3 Design Scenario 2: Evaluate compressor performance for variation of built-in volume index, rotor length and rotor wrap angle

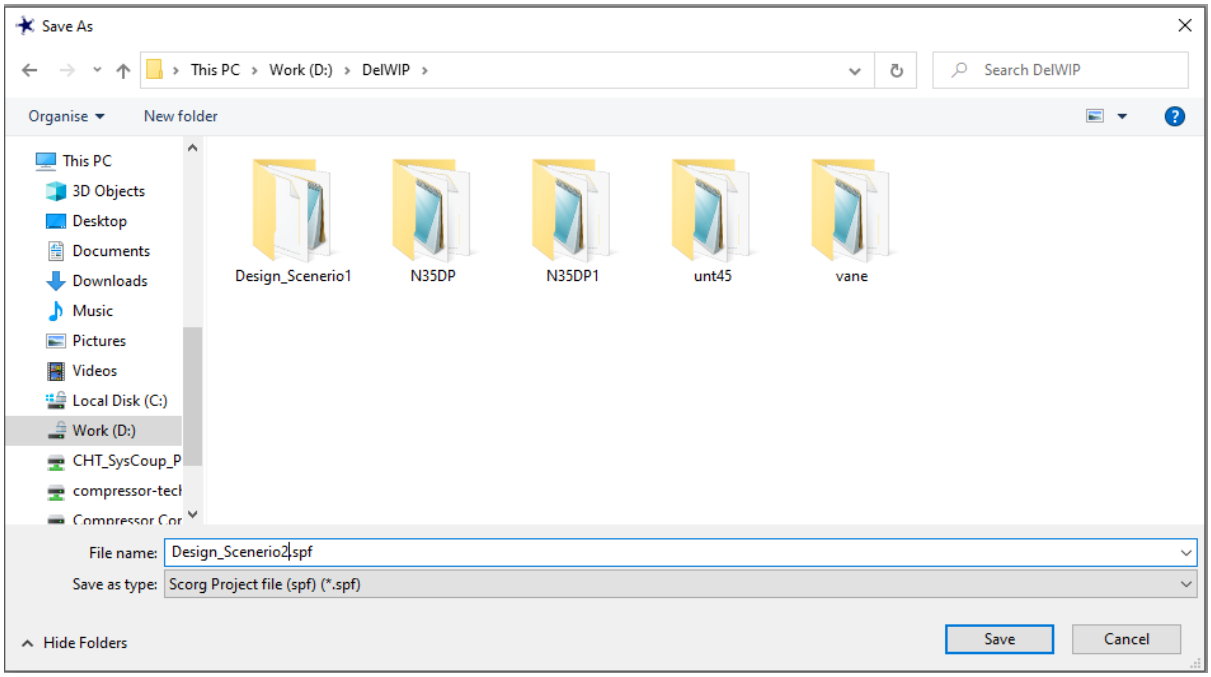
- Launch SCORG™ on the Desktop.
- Select File → New



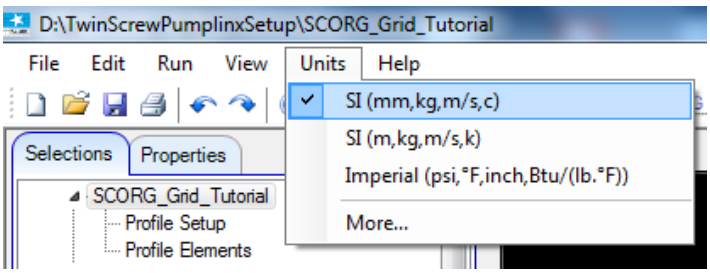
- Select N35_Template.spt → Open



- Save the project in a new folder



- Set Project Units to SI



- Set the following Profile Parameters to get desired clearance size:

GAPI = 0.06mm

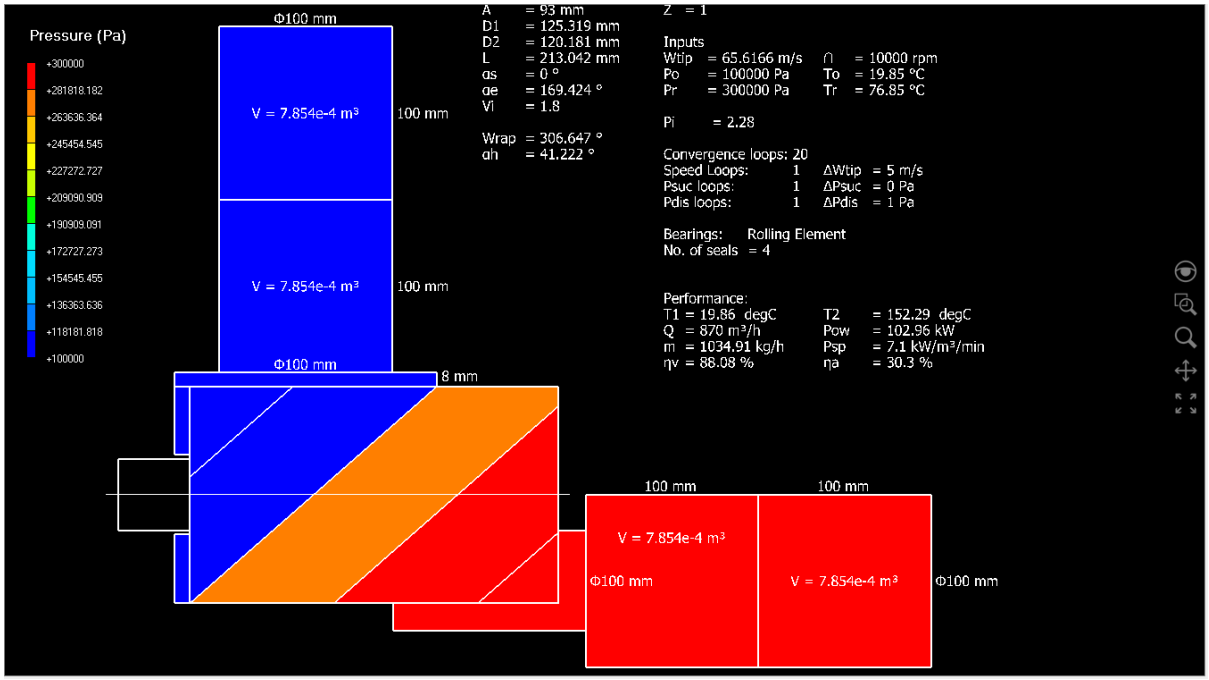
GAPR = 0.06mm

GAPA = 0.05mm

- Go to Thermodynamics → Set the following parameters:

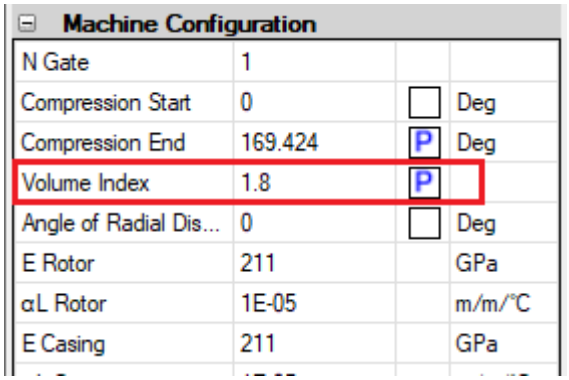
Working Conditions		
Wtip	66.6665	m/s
Rotor Speed	10000	RPM
P0	100000	Pa
Pr	300000	Pa
T0	293	K
Tr	350	K
Tevp	268	K
Tcond	313	K
T Ambient	293	K
Ts	0	K
X	1	

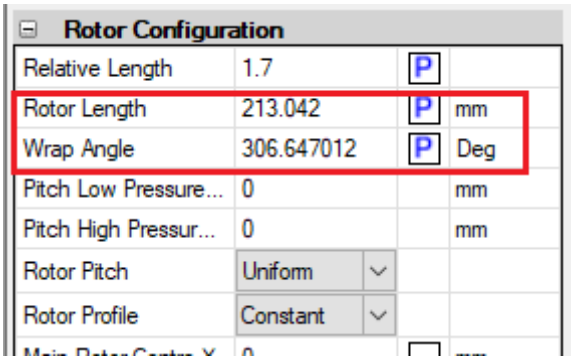
- Save the Project.
- Run Geometry and Thermodynamics
- Inspect the performance data



```
T1     = 19.86 degC      T2     = 152.29 degC
P1     = 1     bar       P2     = 3      bar
Moil   = 0     kg/s      Toil   = 36.86  degC
                         Poil   = 3      bar

Volume Index Vi          = 1.8
Pressure Ratio Pi        = 2.28
Speed                    = 10000 rpm
Tip speed                = 65.62 m/s

Volume flow rate         = 14.5    m3/min
                         = 870     m3/h
Mass flow rate           = 1034.91 kg/h
Volumetric efficiency    = 88.08   %

Power (excl. gearbox)    = 102.96  kW
                         = 138.07  HP
Specific power           = 7.1     kW/m3/min
Adiabatic efficiency     = 30.3    %

Theoretical mass flow    = 1174.96 kg/h
Discharge mass flow      = 1034.91 kg/h
```

- Design Exploration: Set built-in volume index, rotor length and rotor wrap angle as parameters





Note that setting Volume Index as a parameter will also set Compression End angle as parameter as these are related.

Similarly, setting Rotor Length as a parameter will also set Relative Length as parameter as these are related.

Five parameters P1 to P5 will be listed in the Current Design Point (DP0)

Table of Design Points

	Name	P1 - Volume Index	P2 - Compression End	P3 - Rotor Length	P4 - Relative Length	P5 - Wrap Angle
▶	Units		Deg	mm		Deg
⚡	DP0 (Current)	1.8	169.424	213.042	1.7	306.647012
*						

- Update Design Point data as below

Table of Design Points

	Name	P1 - Volume Index	P2 - Compression End	P3 - Rotor Length	P4 - Relative Length	P5 - Wrap Angle
	Units		Deg	mm		Deg
⚡	DP0 (Current)	1.2	87.738	213.042	1.7	306.647012
⚡	DP1	1.5	136.82	213.042	1.7	306.647012
⚡	DP2	1.8	87.738	213.042	1.7	306.647012
⚡	DP3	2.2	199.081	213.042	1.7	306.647012
⚡	DP4	1.2	87.738	180	1.43633975	306.647012
⚡	DP5	1.2	87.738	250	1.99491631	306.647012
⚡	DP6	1.2	87.738	213.042	1.7	250
⚡	DP7	1.2	87.738	213.042	1.7	275
⚡	DP8	1.2	87.738	213.042	1.7	325
▸*						

Volume Index has been increased from 1.2 to 2.2.

Rotor Length has been varied from 180 mm to 250 mm.

Wrap Angle has been varied from 250 deg to 325 deg.

- Select Calculations of Geometry and Thermodynamics

Design Point Calculation Selection

ID	Calculation	Options	On/Off
1	*Generate Profile*	*User Specified Profile*	
2	Geometry	Screw Compressor	☑
3	Thermodynamics		☑
4	Force		☐
5	Grid - Rack	Off	☐
6	*Grid - Boundary*	*Casing to Rotor Nonconformal*	
7	*Grid - Rotor2D*		
8	Grid - Ports	Axial	☐
9	*Grid - CFDPreprocessor*	*Off*	
	Vertex Files Start Number	*1*	
	Vertex Files End Number	*40*	
10	Export CAD	STEP Format	☐

- Right-Click DP table and Update All Design Points

Table of Design Points

	Name	P1 - Volume Index	P2 - Compression End	P3 - Rotor Length	P4 - Relative Length	P5 - Wrap Angle
	Units		Deg	mm		Deg
⚡	DP0 (Current)	1.2	87.738	213.042	1.7	306.647012
⚡	DP1	1.5	136.82	213.042	1.7	306.647012
⚡	DP2	1.8	87.738	213.042	1.7	306.647012
⚡	DP3			3.042	1.7	306.647012
⚡	DP4			30	1.43633975	306.647012
⚡	DP5			50	1.99491631	306.647012
⚡	DP6			13.042	1.7	250
⚡	DP7			13.042	1.7	275
⚡	DP8			13.042	1.7	325
▸*						

- Set as Current Design Point
- Update Design Point
- Clear Output of Design Point
- Save Design Point As
- Delete Design Point
- Update All Design Points
- Clear Output of All Design Points
- Delete All Design Points

On completion of the calculations, the status icons will indicate an up-to-date result.

Table of Design Points

	Name	P1 - Volume Index	P2 - Compression End	P3 - Rotor Length	P4 - Relative Length	P5 - Wrap Angle
	Units		Deg	mm		Deg
✓	DP0 (Current)	1.2	87.738	213.042	1.7	306.647012
✓	DP1	1.5	136.82	213.042	1.7	306.647012
✓	DP2	1.8	87.738	213.042	1.7	306.647012
✓	DP3	2.2	199.081	213.042	1.7	306.647012
✓	DP4	1.2	87.738	180	1.43633975	306.647012
✓	DP5	1.2	87.738	250	1.99491631	306.647012
✓	DP6	1.2	87.738	213.042	1.7	250
✓	DP7	1.2	87.738	213.042	1.7	275
✓	DP8	1.2	87.738	213.042	1.7	325
▸*						

- Review the performance data

Design Point Performance Data (Click variable name to sort performance data)

N[rpm]	Psuc[bar]	Pdis[bar]
10000	1	3

	DP	Qn	M	ηv	Power	Psp	ηad
	Units	nm3/m	kg/min	_	Kw	kW/m3/min	_
✓	DP0	14.064	16.716	0.8536	124.864	8.883	0.2421
✓	DP1	14.446	17.17	0.8768	107.248	7.428	0.2896
✓	DP2	14.064	16.716	0.8536	124.864	8.883	0.2421
✓	DP3	14.506	17.242	0.8805	103.635	7.148	0.3009
✓	DP4	11.664	13.864	0.8379	106.77	9.158	0.2349
✓	DP5	16.712	19.863	0.8644	145.582	8.716	0.2468
✓	DP6	14.757	17.54	0.867	122.664	8.316	0.2586
✓	DP7	14.385	17.098	0.855	128.019	8.904	0.2416
✓	DP8	14.064	16.716	0.8536	124.864	8.883	0.2421

It can be seen from the volumetric efficiency data that the sensitivity of GAPI is highest and GAPA is the least for this compressor design at the given operating condition.

Click on the Specific Power column title to arrange data in ascending order.

Design Point Performance Data (Click variable name to sort performance data)

N[rpm]	Psuc[bar]	Pdis[bar]
10000	1	3

	DP	Qn	M	ηv	Power	Psp △	ηad
	Units	nm3/m	kg/min	_	Kw	kW/m3/min	_
✓	DP3	14.506	17.242	0.8805	103.635	7.148	0.3009
✓	DP1	14.446	17.17	0.8768	107.248	7.428	0.2896
✓	DP6	14.757	17.54	0.867	122.664	8.316	0.2586
✓	DP5	16.712	19.863	0.8644	145.582	8.716	0.2468
✓	DP2	14.064	16.716	0.8536	124.864	8.883	0.2421
✓	DP0	14.064	16.716	0.8536	124.864	8.883	0.2421
✓	DP8	14.064	16.716	0.8536	124.864	8.883	0.2421
✓	DP7	14.385	17.098	0.855	128.019	8.904	0.2416
✓	DP4	11.664	13.864	0.8379	106.77	9.158	0.2349

Lest Specific Power is obtained for DP3 with Volume Index = 2.2 as the compressor discharge pressure is set at 3.0 bar.

For short rotors of DP4 = 180 mm with low Volume Index = 1.2, the Specific Power is the highest.

Click on the Volumetric Efficiency column title to arrange data in descending order.

Design Point Performance Data (Click variable name to sort performance data)

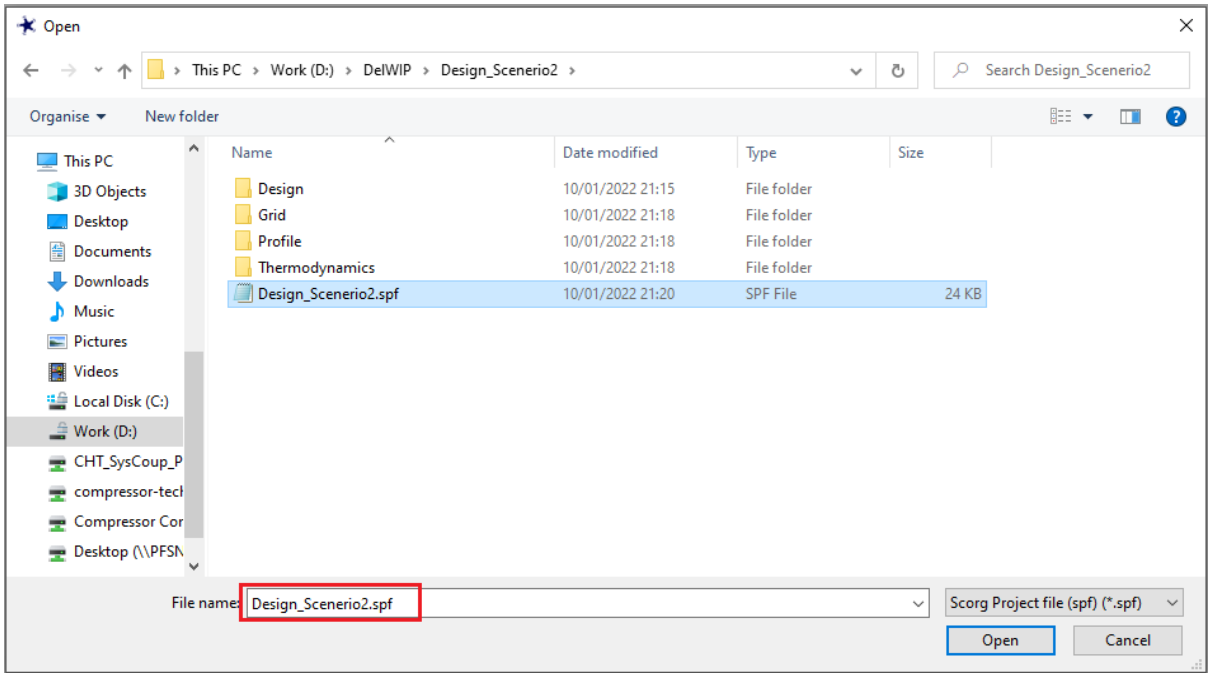
N[rpm]	Psuc[bar]	Pdis[bar]
10000	1	3

	DP	Qn	M	ηv	Power	Psp	ηad
▶	Units	nm3/m	kg/min	_	Kw	kW/m3/min	_
✔	DP3	14.506	17.242	0.8805	103.635	7.148	0.3009
✔	DP1	14.446	17.17	0.8768	107.248	7.428	0.2896
✔	DP6	14.757	17.54	0.867	122.664	8.316	0.2586
✔	DP5	16.712	19.863	0.8644	145.582	8.716	0.2468
✔	DP7	14.385	17.098	0.855	128.019	8.904	0.2416
✔	DP8	14.064	16.716	0.8536	124.864	8.883	0.2421
✔	DP0	14.064	16.716	0.8536	124.864	8.883	0.2421
✔	DP2	14.064	16.716	0.8536	124.864	8.883	0.2421
✔	DP4	11.664	13.864	0.8379	106.77	9.158	0.2349
*							

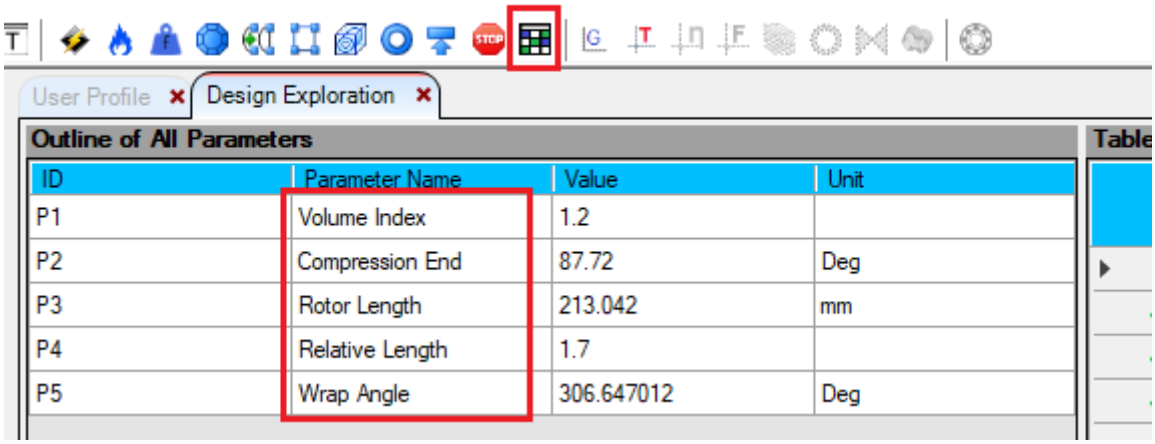
Highest Volumetric Efficiency is obtained again for DP3.

4 Design Scenario 3: Compressor performance map for variation of built-in volume index, rotor length and rotor wrap angle

- Launch SCORG™ on the Desktop.
- Select File → Open the project saved in Design Scenario 2



- Open Design Exploration: Set for built-in volume index, rotor length and rotor wrap angle as parameters



An up-to-date status will be seen for the data.

Table of Design Points

	Name	P1 - Volume Index	P2 - Compression End	P3 - Rotor Length	P4 - Relative Length	P5 - Wrap Angle
	Units		Deg	mm		Deg
✓	DP0 (Current)	1.2	87.738	213.042	1.7	306.647012
✓	DP1	1.5	136.82	213.042	1.7	306.647012
✓	DP2	1.8	87.738	213.042	1.7	306.647012
✓	DP3	2.2	199.081	213.042	1.7	306.647012
✓	DP4	1.2	87.738	180	1.43633975	306.647012
✓	DP5	1.2	87.738	250	1.99491631	306.647012
✓	DP6	1.2	87.738	213.042	1.7	250
✓	DP7	1.2	87.738	213.042	1.7	275
✓	DP8	1.2	87.738	213.042	1.7	325
▸*						

Design Point Performance Data (Click variable name to sort performance data)

N[rpm]	Psuc[bar]	Pdis[bar]
10000	1	3

	DP	WTP	N	Q	Qn	M	ηv	Pov
▸	Units	m/s	RPM	m3/m	nm3/m	kg/min	_	Kw
✓	DP0	65.62	10000	14.057	14.064	16.716	0.8536	124
✓	DP1	65.62	10000	14.438	14.446	17.17	0.8768	107
✓	DP2	65.62	10000	14.057	14.064	16.716	0.8536	124
✓	DP3	65.62	10000	14.499	14.506	17.242	0.8805	103
✓	DP4	65.62	10000	11.658	11.664	13.864	0.8379	106
✓	DP5	65.62	10000	16.703	16.712	19.863	0.8644	145
✓	DP6	65.62	10000	14.75	14.757	17.54	0.867	122
✓	DP7	65.62	10000	14.378	14.385	17.098	0.855	128
✓	DP8	65.62	10000	14.057	14.064	16.716	0.8536	124

- Design Exploration: Set Rotor Speed and Discharge Pressure for performance map.
- In Thermodynamics → Working Conditions, set Rotor Speed and Discharge Pressure

Working Conditions

Wtip	52.4933	m/s
Rotor Speed	8000	RPM
P0	100000	Pa
Pr	150000	Pa
T0	19.85	°C
Tr	76.85	°C
Tevp	-5.15	°C
Tcond	39.85	°C
T Ambient	19.85	°C

- In Thermodynamics → Thermodynamic Controls, set Speed loop, Discharge Pressure loop, Tip speed increment and Discharge Pressure increment values.

Thermodynamic Controls		
Speed loop	5	
Psuc loop	1	
Pdis loop	4	
Convergence loop	20	
Convergence criteria	0.5	℃
ΔWtip	5	m/s
ΔPsuc	0	Pa
ΔPdis	50000	Pa
ΔTevp	5	℃
ΔTcon	5	℃

- These updated settings will clear the existing performance data and DP status icons will change.

Table of Design Points

	Name	P1 - Volume Index	P2 - Compression End	P3 - Rotor Length	P4 - Relative Length	P5 - Wrap Angle
▶	Units		Deg	mm		Deg
⚡	DP0 (Current)	1.2	87.72	213.042	1.7	306.647012
⚡	DP1	1.5	136.822	213.042	1.7	306.647012
⚡	DP2	1.2	87.72	213.042	1.7	306.647012
⚡	DP3	2.2	199.103	213.042	1.7	306.647012
⚡	DP4	1.2	87.72	180	1.43633975	306.647012
⚡	DP5	1.2	87.72	250	1.99491631	306.647012
⚡	DP6	1.2	87.72	213.042	1.7	249.999993
⚡	DP7	1.2	87.72	213.042	1.7	274.999975
⚡	DP8	1.2	87.72	213.042	1.7	306.647012
*						

- Select Calculations of Geometry and Thermodynamics

Design Point Calculation Selection

ID	Calculation	Options	On/Off
1	*Generate Profile*	*User Specified Profile*	
2	Geometry	Screw Compressor	☑
3	Thermodynamics		☑
4	Force		☐
5	Grid - Rack	Off	☐
6	*Grid - Boundary*	*Casing to Rotor Nonconformal*	
7	*Grid - Rotor2D*		
8	Grid - Ports	Axial	☐
9	*Grid - CFDPreprocessor*	*Off*	
	Vertex Files Start Number	*1*	
	Vertex Files End Number	*40*	
10	Export CAD	STEP Format	☐

- Right-Click DP table and Update All Design Points

Table of Design Points

	Name	P1 - Volume Index	P2 - Compression End	P3 - Rotor Length	P4 - Relative Length	P5 - Wrap Angle
	Units		Deg	mm		Deg
⚡	DP0 (Current)	1.2	87.738	213.042	1.7	306.647012
⚡	DP1	1.5	136.82	213.042	1.7	306.647012
⚡	DP2	1.8	87.738	213.042	1.7	306.647012
⚡	DP3			3.042	1.7	306.647012
⚡	DP4			30	1.43633975	306.647012
⚡	DP5			50	1.99491631	306.647012
⚡	DP6			13.042	1.7	250
⚡	DP7			13.042	1.7	275
⚡	DP8			13.042	1.7	325
▸*						

Set as Current Design Point
Update Design Point
Clear Output of Design Point
Save Design Point As
Delete Design Point
Update All Design Points
Clear Output of All Design Points
Delete All Design Points

On completion of the calculations, the status icons will indicate an up-to-date result.

Table of Design Points

	Name	P1 - Volume Index	P2 - Compression End	P3 - Rotor Length	P4 - Relative Length	P5 - Wrap Angle
	Units		Deg	mm		Deg
✓	DP0 (Current)	1.2	87.738	213.042	1.7	306.647012
✓	DP1	1.5	136.82	213.042	1.7	306.647012
✓	DP2	1.8	87.738	213.042	1.7	306.647012
✓	DP3	2.2	199.081	213.042	1.7	306.647012
✓	DP4	1.2	87.738	180	1.43633975	306.647012
✓	DP5	1.2	87.738	250	1.99491631	306.647012
✓	DP6	1.2	87.738	213.042	1.7	250
✓	DP7	1.2	87.738	213.042	1.7	275
✓	DP8	1.2	87.738	213.042	1.7	325
*						

- Review the performance data

Design Point Performance Data (Click variable name to sort performance data)

N[rpm]	Psuc[bar]	Pdis[bar]
8000	1	1.5

	DP	WTP	N	Q	Qn	M	ηv	Po
	Units	m/s	RPM	m3/m	nm3/m	kg/min	_	Kw
✓	DP0	52.49	8000	12.021	12.027	14.295	0.9125	32.
✓	DP1	52.49	8000	12.01	12.016	14.282	0.9117	32.
✓	DP2	52.49	8000	12.021	12.027	14.295	0.9125	32.
✓	DP3	52.49	8000	11.756	11.762	13.98	0.8924	44.
✓	DP4	52.49	8000	10.07	10.076	11.976	0.9047	28.
✓	DP5	52.49	8000	14.187	14.194	16.871	0.9177	37.
✓	DP6	52.49	8000	12.489	12.495	14.852	0.9176	31.
✓	DP7	52.49	8000	12.284	12.29	14.608	0.9132	33.
✓	DP8	52.49	8000	12.021	12.027	14.295	0.9125	32.
*								

In the performance data table there is a set of pull-down menu which indicates the rotor speed N [rpm], suction pressure Psuc [bar] and discharge pressure Pdis [bar] for which the data in the table is listed.

In Design Scenario 2, it was found that DP3 has the best Specific Power at 3.0 bar discharge pressure.

- Select 11048.1 rpm speed and 3.0 bar discharge pressure and the design data is re-confirmed.

Design Point Performance Data (Click variable name to sort performance data)

N[rpm]	Psuc[bar]	Pdis[bar]
11048.1	1	3

	DP		Qn	M	ηv	Power	Psp	ηad
	Units		nm3/m	kg/min	_	Kw	kW/m3/min	_
✓	DP3		16.181	19.232	0.8889	120.797	7.469	0.288
✓	DP1		16.124	19.164	0.8858	124.787	7.743	0.2778
✓	DP6		16.492	19.602	0.877	142.971	8.673	0.248
✓	DP5		18.668	22.188	0.874	170.737	9.151	0.2351
✓	DP2		15.749	18.719	0.8652	146.048	9.278	0.2318
✓	DP0		15.749	18.719	0.8652	146.048	9.278	0.2318
✓	DP8		15.749	18.719	0.8652	146.048	9.278	0.2318
✓	DP7		16.095	19.13	0.866	150.013	9.325	0.2307
✓	DP4		13.101	15.572	0.8519	124.567	9.513	0.2261

- Now select 11048.1 rpm speed and 1.5 bar discharge pressure and the arrange the Specific Power in ascending order. It is seen that for lower delivery pressure DP6 has better Specific Power due to lower volume index = 1.2 and a lower Wrap Angle = 250 deg.

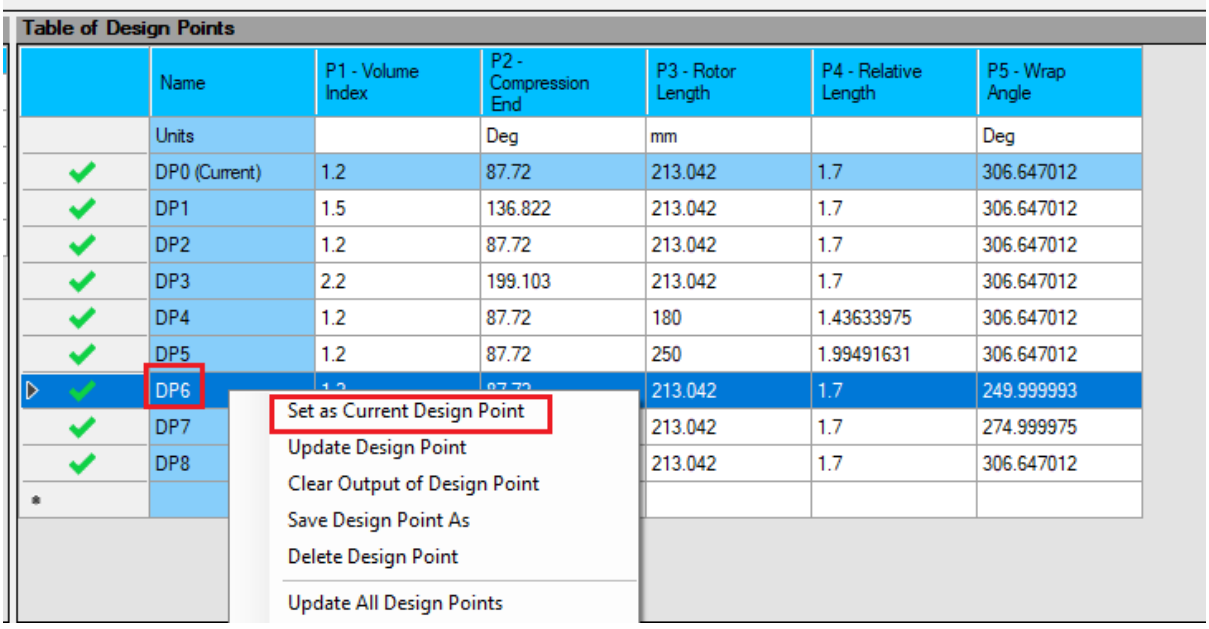
Design Point Performance Data (Click variable name to sort performance data)

N[rpm]	Psuc[bar]	Pdis[bar]
11048.1	1	1.5

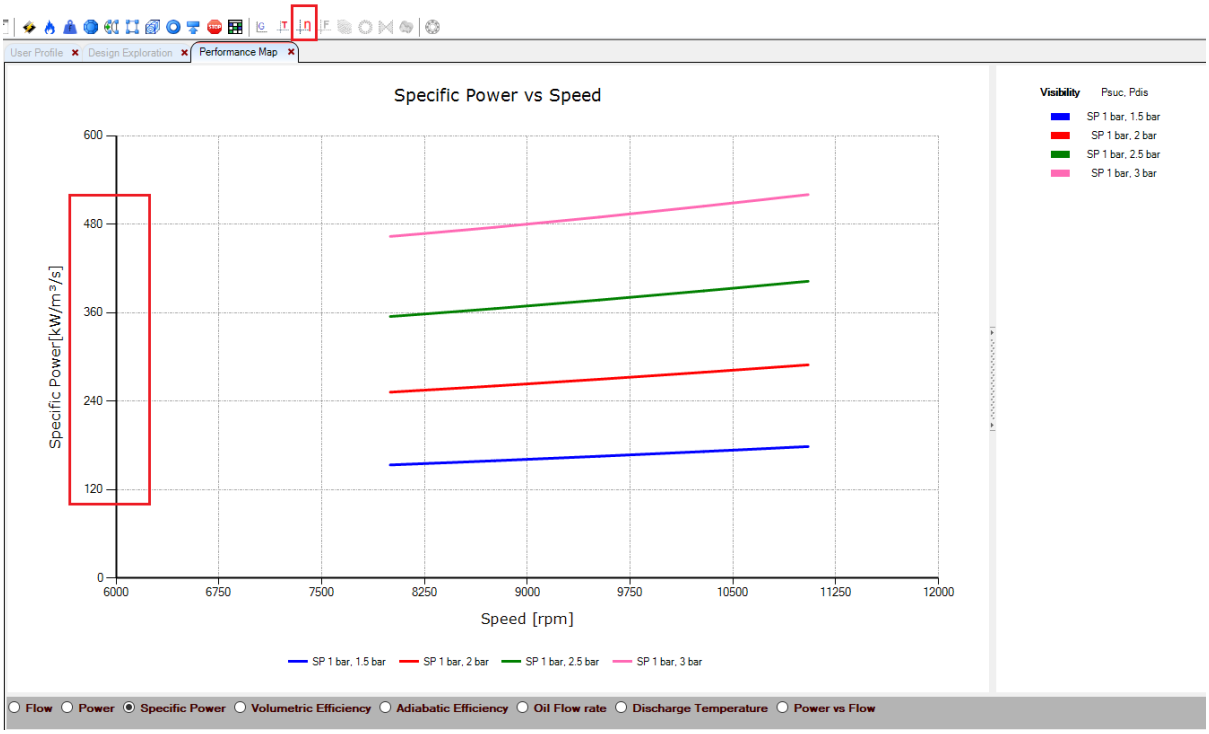
	DP		Qn	M	ηv	Power	Psp	ηad
	Units		nm3/m	kg/min	_	Kw	kW/m3/min	_
✓	DP6		17.514	20.817	0.9313	52.095	2.976	0.2408
✓	DP1		16.88	20.063	0.9273	52.624	3.119	0.2297
✓	DP5		19.846	23.589	0.9291	62.399	3.146	0.2278
✓	DP8		16.892	20.078	0.928	53.499	3.169	0.2261
✓	DP0		16.892	20.078	0.928	53.499	3.169	0.2261
✓	DP2		16.892	20.078	0.928	53.499	3.169	0.2261
✓	DP7		17.247	20.5	0.9279	55.933	3.245	0.2208
✓	DP4		14.211	16.89	0.924	46.111	3.247	0.2207
✓	DP3		16.615	19.748	0.9128	74.209	4.469	0.1603

- Click on the Performance Map icon in main menu.

- This will plot the performance map for Current Design Point which is DP0.
- Go back to Design Exploration tab, Right-click Design Point table on DP6 and Set as Current Design Point.



- Click again on the Performance Map icon in main menu.
- This will plot the performance map for new Current Design Point which is DP6



- A lower Specific Power with DP6 can be seen over the whole speed range at all discharge pressures as compared to DP0 plots.

- Go back to Design Exploration tab, Right-click Design Point table on DP3 and Set as Current Design Point.

Table of Design Points

	Name	P1 - Volume Index	P2 - Compression End	P3 - Rotor Length	P4 - Relative Length	P5 - Wrap Angle
	Units		Deg	mm		Deg
✓	DP0	1.2	87.72	213.042	1.7	306.647012
✓	DP1	1.5	136.822	213.042	1.7	306.647012
✓	DP2	1.2	87.72	213.042	1.7	306.647012
✓	DP3 (Current)	2.2	199.103	213.042	1.7	306.647012
✓	DP4	1.2	87.72	180	1.43633975	306.647012
✓	DP5	1.2	87.72	250	1.99491631	306.647012
✓	DP6	1.2	87.72	213.042	1.7	249.999993
✓	DP7	1.2	87.72	213.042	1.7	274.999975
✓	DP8	1.2	87.72	213.042	1.7	306.647012
*						

- Click again on the Performance Map icon in main menu.
- This will plot the performance map for new Current Design Point which is DP3.

- A lower Specific Power with DP3 can be seen over the whole speed range at the high discharge pressures of 3.0 bar as compared to DP0 and DP6 plots. But at lower discharge pressures of 1.5 and 2.0 bar, the Specific Power of DP3 is higher than that of DP0 and DP6.

Thus, for the desired operating condition of the compressor the design can be analysed, and a better configuration can be obtained using the SCORG Design Exploration Framework.

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