Spring Wiz v1.1 B Updates:

The v1.1B has several new enhancements, which include:

Standard and Plus Version new features:

You can now print different types of Reports from the Main Screen. Fig 1,2.

You can now print "More" types of Reports from the Cam Harmonics/Analysis screen under File. Fig 15.

The Spring ODs turn Red if the clearance between the larger spring's ID does not fall within certain limits of this particular Spring's OD. These limits can be set in Preferences, either a negative clearance (spring interference) or positive (a gap between the springs). Fig 3, 5A.

There is a new Calculation Utility for Spring O.D. for the 2nd and 3rd springs. Hold the Shift Key down when you click on Spring O.D. to see this option. Fig 5B, 7.

There is a new output on the main screen of Net Valve Lift, which is the same as the existing Gross Valve Lift, but with the lash subtracted out. Gross Valve Lift is what cam grinders will show in their catalog. Net Valve Lift is what the valve will actually do. These 2 lifts are based on cam inputs in the Cam/Valve Train Analysis screen. If the cam is hydraulic, the "lash" is assumed to be .006". Fig 3.

If the Difference between Installed Height and Open Height is not equal to the Net Valve Lift, the Open Height will change to Red. Fig 3, 4.

There is a new Calculation Utility for Open Height. Hold the Shift Key down when you click on Open Height to see this option. Fig 5B, 6.

You can turn Off the introductory "Warning" screen by clicking on the "Don't Show This Again" check box.

Reports now include the estimated Spring Mass for each spring. Fig 2.

This new version has adjusted the calculation for Bind Height for the number of coils for better accuracy.

Features which access the internet now work better to use your default internet browser.

Plus Version new features (not in Basic version):

Fatigue and Stress Analysis reports have been added, to estimate the life of the springs. Fig 8, 9.

Beehive and Tapered springs have been added as Spring Types. Fig 3, 10, 11.

The Calculation utility for Valve Mass now has an adjustment for standard Cylindrical, Tapered or Beehive springs. Fig 12.

Detailed, High Resolution Graphs for the Frequency Analysis screen have been added. Fig 13 - 25.



				Spring Wi	iz 'Plus' - Pe	rformance	Trends Inc.			
				File Edit Car	n/Valve Train Ar	alysis Repo	orts Preferen	tes Help Reg	To: Kevin Gertgen	
				File	Example Spring	1 M	lain Screen			I Ex
				Comments	Example Valve	Spring (M	lain Screen and	More		Ex.
			Fia 1	Deseline Co		M	lain Screen with	Comments		
				Baseline Sp	oring	M	lain Screen and	More with Commer	nts	Spr
				Wire Dia, in	.18	.14 S	tress and Life E	xpentancy Report		
			ı ا	Spring O.D.,	in 1.2	1.84 ^{SI}	trèss and Life E	xpentancy Report	with Comments	, in
		Fig 2		Frank an alla				,		
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Spring:	Baseline				Proposed			the Plus Ve	ersion only	
File:	Example S	Spring 1			Example	Spring 2	: L			
	Base	2nd	3rd	Rev Kit	Base	2nd	3rd	Rev Kit		
Wire Dia, in	.18	.14	.07		.18	.18	.18	.18		
Spring U.V., in Eree Length in	1.2	.84	.50 2.2		1.21	.98	.5	רט. א		
# Total Coils	6	8	9		6	10.5	8	11		
# Active Coils	4.	6.	7.7		4.	8.5	6.7	9.		
# Inactive Coils	2	2	1.3		2	2	1.3	2		
Туре	Cylinder	Cylinder	Cylinder		Cylinder	Cylinde	r Cylinde	r Cylinder		
Small End O.D. in										
Std Spring Steel	Yes	Yes	Yes		Yes	Yes	Yes	Yes		
Youngs Mod. psi Eo Poissons Patio										
Densitu lb/cu in										
Aspect Ratio	1	1	1		1	1	1	1		
Installed Ht, in	1.8	1.690	1.680		1.8	1.700	1.680	2.3		
Retainer Step, in		.11	.12			.1	.12			
Open Ht, in	1.43	1.320	1.310		1.3	1.200	1.180	1.780		
Spring Rate, 1b/in	356.62	269.15	38.21		346.33	347.81	6892.62	294.14		
Installed Force, 1b	107.0	110.3	19.9		103.9	139.1	3584.2	505.9		
Upen Force, 1D Pind Wt in	238.9	209.9	34.0		2//.1	313.0	7030.5	058.9		=
Nat Fren	551 2	606 8	.034 482 5		.903 540 6	1.773 421 7	3343 1	370 0		
Nat Freq. CPM	33074	36411	28949		32435	25301	200583	22199		
Bind Stress, psi	229185	245373	264075		224235	53871	1670738	305471		
lotal (or limit)	449 00				7000 00					
Spring Kale, 10/10 Installed Force lb	003.98				7880.90 1999 1					
Onen Force, 1b	482.8				8279.5					
Bind Ht. in	1.029				1.773					
Nat Freq	482.5				370.0					
Nat Freq, CPM	28949				22199					
Bind Stress, psi	264075				1670738					
Cam Specs						Г				
Installed on	Intake				Exhaust	E	Estimated	spring mas	s is shown	
R.A.R.	1.3				1	١h	ere. in all	versions.		
Lash	. 02 0				. 02		, -			
Gross Valve Lift	.39				.6					
Valve Lift Bind Lim	.661				073					
Additional Info										
Installed Stress	69471	93933	87660		59165	65897	1156836	243004		
Open Stress	135052	178703	150033		157773	148269	2269178	317335		
Spring Mass, gms	50.1	29.1	6.1		50.6	74.7	23.1	81.6		
Coil OD	1.200	.840	.560		1.210	.980	.500			
Coil ID	.840	.560	.420		.850	.620	.140			
COIL CLEAMANCE		.000	. 000			130	.120			
Spring Wiz Plus v1.	18 Peri	Formance	Trends In	c (C) 202	4					
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🚰 Spring Wiz 'Plus' - Perfo	ormance Trends Inc.						
File Edit Cam/Valve Train Analysis Reports Preferences Help Reg To: Kevin Gertgen							
File Example Spring 1	Find a Spring	File Example Spring 2					
Comments Example Valve Spring Comment #1 Comments Example Valve Spring 2 Comment #1							
Baseline Spring	▼ 2nd ▼_3rd □ Rev Kit	Proposed Spring	🔽 2nd 🔽 3rd 🔽 R	ev Kit			
Wire Dia, in .18	Red background indica	ates the OD of	.18 .18 .18	Installed on			
Spring O.D., in 1.2	this spring is not within	limits of ID of	.5 1.01	Exhausl 💌			
Free Length, in 2.1		. 2.1	2.1 2.2 4				
# Total Coils 6		# Total Coils 6	10.5 8 11				
# Active Coils 4.	6. 7.7	# Active Coils 4.	8.5 6.7 9.				
# Inactive Coils 2	2 1.3 Lash	# Inactive Coils 2	2 1.3 2	Lash			
Type Cylind 🛫	Cylind V Cylind V	Type Cylind	 Cylind Cylind Cylind 	02			
Small End O.D. in Cylinder	Small End O.D. in Net Valve Small End O.D. in Net Valve						
Std Spring Steel Beehive	Yes New spring	Std Spring Steel	Ves 🔻 Yes 💌 Yes	▼ Lift			
Youngs Mod. psi E6	Youngs Mod. psi E6 Plus Version Same Youngs Mod. F Red background indicator						
Poissons Ratio							
Bed background indicates difference between Density b/cu ir one of the springs.							
Installed and Open Hts	s do no match Net Valve Lift.	Aspect Ratio ? 1	1 1 1	Valve Lift Bind Limit			
Hold Shift key down ar	nd click to Calculate a new	Installed Ht, in 1.8	1.700 1.680 2.3	073			
Open Ht. Other Open	Hts shown in bold text	Retainer Step, in	.1 .12				
		Open Ht, in 1.3	1.200 1.180 1.78	Distal (or Limit)			
Spring Rate, Ib/in 356.62	269.15 38.21 663.98	Spring Rate, Ib/in 346.33	347.81 6892.82 294.1	14 7880.90			
Installed Force, Ib 107.0	110.3 19.9 237.2	Installed Force, lb 1033	139.1 3584.2 505.9	4333.1			
Open Force, lb 238.9	Bold text in these calculated Ope	en Force, Ib	313.0 7030.5 658.9	8279.5			
Bind Ht, in .963	Hts (with yellow background) ind	icate ^{nd Ht, in} .963	1.773 1.449 1.863	3 1.773			
Nat Freq 551.2	coil bind for this spring.	at Freq 540.6	421.7 3343.1 370.0	370.0			
Nat Freq, CPM 33074	36411 28949 28949	Nat Freq, CPM 32435	25301 200583 2219	9 22199			
Bind Stress, psi 229185	245373 264075 264075	Bind Stress, psi 224235	53871 1670738 3054	71 1670738			
Fig 3							

	Fig 4 Aspect Ratio Installed Ht, in Retainer Step, in Open Ht, in	1 8 1.690 .11 43 1.320	1 1.680 12 1.310	Valve Lift Bind Limit [661 Total (or Limit)	Aspect Ratio ? Installed Ht, in Retainer Step, in Open Ht, in	1 1.8 1.22	1 1.700 .1 1.120	1 1 1.680 2.3 .12 1.700	Valve Lift Bind Limit .073 Total (or Limit)
	Spring Rate, Ib/in 35	56.62 269.15	38.21	663.98	Spring Rate, Ib/in	230.89	347.81	6892.62 294.14	7765.46
R oʻ sl d ir	Red text indicates Coil Bind encountered for the Primary spring. The other springs which also have Coil Bind with yellow background are shown in bold text. The white background indicates the height difference between Installed Ht and Open Ht (1.8 inches and 1.22 inches) matches the Net Valve Lift of .580. The Net Valve Lift is								

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determined from inputs in the Cam/Valve Train Analysis screen.

Click on Preferences at the top of the Main Screen	ports Preferences Help Reg To: Kevin Gertgen Fig 5A
Hold down the Shift Key while clicking on the in input (in this case the red Spring O.D.) and you are presented with a menu of options. Choose the "Calculate from Other Measurements" to be presented with a Calculation utility for this input.	Preferences d 3rd .07 .07 .560 Nat. Freq. Factor Program Default 2-2 Units 9 1.3 0.D. Clearance for Too Loose .05
Hold down the Shift Key while clicking on the in input (in this case the red Spring O.D.) and you are presented with a menu of options. Choose the "Calculate from Other Measurements" to be presented with a Calculation utility for this input.	 Yes Title on Printouts Title 1 This Title 1 is contained in Preferen Title 2 This Title 2 is contained in Preferen 1 Notes: Click on Help for info on these settings. 1.680 .12 Keep Settings Help Cancel Print

Fig 5B	Proposed Spring		🔽 2nd	🔽 3rd	🔽 Rev k	Kit	
	Wire Dia, in	.18	.18	.18	.18	Installed on	
Hold down the Shift Key while clicking on the in input (in this case the red Spring $O(D_{n})$ and you	Spring O.D., in	1.21	.98	Calculate	1 01 from Other I	Exhaust	4
are presented with a menu of options. Choose	Free Length, in	2.1	2.1	Show Defi	nition		1
the "Calculate from Other Measurements" to be	# Total Coils	10	10.5	Close This	Menu		
presented with a Calculation utility for this input.	# Active Coils	8.	8.5	6.7	9.		T

Screen to calculate Spri	ng OD from the larger spring's	Calc Spring OD		
OD and Wire Diameter,	and the Desired Clearance.	Calc Spring OD .840		
Fig	Fig 7	Larger Spring Specs		
	Calc Open Height	DD [outside diameter], in 1.21		
Screen to calculate	Calc Open Height 1.220			
Open Ht from Installed Height, and Net Valve Lift.	Specs Net Valve Lift .580	Clearance Desired Clearance, in .01		
	Installed Height, in	Note: Enter the Desired Clearance you want between the Inside Diameter of the larger spring and this		
	Note: This calculation is based on Valve Lift from the Cam/Valve Train screen, and the Installed Height of the spring.	spring. Enter a negative clearance if you want the springs to rub against each other. Note: This is the total clearance, so if you enter .001 for Desired Clearance, there will be .0005 clearance all the way around the spring.		
	Use Calc Value Help Cancel Print	Use Calc Value Help Cancel Print		

Plus Version, Stress and Fatigue Analysis:

The Plus version estimates the Stress and Fatigue life of the valve spring you have designed to work with the valve lift of the cam. Think of bending a piece of wire like a paper clip back and forth. If you don't bend it very far, it may take a

long time before it breaks, or it may never break. Bend it a lot and it could fail with only 5-10 cycles.

This example illustrates the engineering principle called fatigue. It is the science of calculating the stress level of a component (like the spring wire) and how the stress is oscillating, and how many cycles it will take before the component will break. The higher the change in this stress level, the fewer

Base

8.1

A

0.0

Stress-Report.txt - Notepad <u>File E</u>dit F<u>o</u>rmat <u>V</u>iew <u>H</u>elp

Baseline File:

Proposed File:

Date: 10/17/24

Installed Height

Installed Stress

Open Height

Open Stress

Number Cycles

Number Cycles

Number Hours

Typical Case Number Cycles

Number Hours

Number Hours

Best Case

Good Case

Spring:

🚰 Spring Wiz 'Plus' - Performance Trends Inc. Fiq 8 File Edit Cam/Valve Train Analysis Reports Preferences Help Reg To: Kevin Gé Main Screen File Example Spring 1 Exa Main Screen and More Exa Comments Example Valve Spring (Main Screen with Comments **Baseline Spring** Sprin Main Screen and More with Comments $\mathbf{\nabla}$ Wire Dia, in .18 .14 Stress and Life Expentancy Report Stress and Life Expentancy Report with Comments Spring O.D., in 1.2 .84 in Free Law etta in 0.4 1 6 4 Free Law allowing ----- Kevin Gertgen ---------- This Title 1 is contained in Preferences ------ This Title 1 ------ This Title 2 is contained in Preferences -------Example Spring 1 Baseline Comment: Example Valve Spring Comment #1 Example Valve Spring Comment #2 Fig 9 Example Valve Spring Comment #3 Example Valve Spring Comment #4 Example Spring 2 Proposed Comment: Example Valve Spring 2 Comment #1 Example Valve Spring 2 Comment #2 Example Valve Spring 2 Comment #3 Example Valve Spring 2 Comment #4 Time: 02:37 pm Valve Spring Life Expectancy Report for Continuous 7000 RPM Based on Stress at Open and Installed Heights Baseline Proposed 2nd 3rd Rev Kit Base 2nd 3rd Rev Kit 1.800 1.690 1.680 1.800 1.788 1.680 2.300 128303 93933 87660 39443 65897 1156836 243004 1.320 1.220 1.700 1.430 1.310 1.120 1.100 286544 178703 150033 115700 161448 2447153 328770 > 10^8 > 10^8 > 10^8 > 10^8 > 10^8 ß > 10^8 938.3 > 10^8 > 10^8 > 10^8 > 10^8 0.0 765.0 > 10^8 1691555 > 10^8 > 10^8 > 10^8 16913 A 0_0 > 10^8 > 10^8 > 10^8 > 10^8 0.1 A 26 > 10^8 A A 0.0 0.0 440903 0.0 0.0 0.0 IMPORTANT: These durability limits can NOT be used to estimate the actual life of valve springs. This information can ONLY be used to give a comparison of a very APPROXIMATE life expectancy between different springs and different operating conditions. Performance Trends Inc (C) 2024

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cycles it will take until the spring wire will fail.

The same is true for valve spring wire. Depending on these spring specs, material properties of the wire and Installed and Open heights, the valve spring could break very quickly. If this is a valve spring for a nitro blown dragster, an estimated life of 0.1 hours is good enough. These springs are typically changed every 5 second run. If this is a valve spring for a street vehicle, it should have a very long or infinite life.

The report on the previous page gives an estimate of the Number of Cycles a valve spring can run before it is likely to break. The Number of Hours is also calculated based on the Max RPM you have entered in the Valve Train specs screen. If the number is reported as "10^E8" it means it is expected to last more than 100,000,000 (100 million) cycles or hours. This means it should have infinite life and be good for production or street vehicles.

There are several methods for calculating Spring Fatigue Life, and the Spring Wiz shows 3 different estimates.

- Best Case: This calculation assumes the very best materials and surface finish (like shot peening), very best manufacturing technology, etc.
- Good Case: This calculation assumes very good materials and surface finish (like shot peening), very good manufacturing technology, etc.
- Typical Case: This calculation will closely match what you will see in typical engineering text books, Machinist Handbook, etc.

What you will typically see for racing springs is that for the Typical Case, they may last only 0 cycles. That means they should break the first time the engine turns over. But obviously that is not the case in the real world, and that is why we have added the Good Case and Best Case estimates.

Plus Version, Tapered and Beehive Springs:

A recent advancement in valve spring design is the use of tapered or beehive springs. The idea is that they will use a smaller retainer and have less spring mass by the retainer. This mass by the retainer moves much like the valve itself, and anything you can do to reduce this mass will allow the engine to rev higher before valve toss is encountered.

Spring Wiz 'Plus' - Performance Ti Fig 10	Spring Wiz 'Plus' - Performance Trends II Fig 11
File Edit Cam/Valve Train Analysis Reports Prefere	File Edit Cam/Valve Train Analysis Reports Prefere
File Example Spring 1	File Example Spring 1
Comments Example Valve Spring Comment #1	Comments Example Valve Spring Comment #1
- Recelling Coving	
vaseiine spring ✓ 2nd ✓ 3rd	Baseline Spring
Wire Dia, in .18 .14 .07	Wire Dia, in .25 .14 .07
Spring O.D., in 1.2 .84 .560	Spring 0.D., in 1.2 .84 .56
Free Length, in 2.1 New spring	Free Length, in 2.1 2.1 2.2
# Total Coils 6 "Types" in Plus	# Total Coils 5.4 8 9
# Active Coils 4.	# Active Coils 3.4 6. 7.7
# Inactive Coils 2 2 1.3	# Inactive Coils 2 2 If you select Tapered or
	Type Taper Cylind Beehive, the "Small End O
Small End O.D. in Cylinder	Small End O.D. in .91 input becomes visible. Her
Std Spring Steel Beebive Yes - Yos -	Std Spring Steel
	Nourse Med. miEf

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🔏 Spring Wiz 'Plus' - Pe	erformance Trends Inc.	Click here for the scre	en below.	
File Edit Cam/Valve Train A	nalysis Reports Preferences	Help Reg To; Kevin Gertgen		
File Example Spring	g 1	Find a Spring File	Example Spri	ing 2
Comments Example Valve	🛱 Cam/Valve Train Spec:	s for:		
Baseline Spring	Back (close) File Cam Harmo	nics/Analysis Help		
Wire Dia, in .25 Spring 0.D., in 1.2 Free Length, in 2.1	Cam Profile Centerline, deg ATDC Duration @ .050 "	Intake Profile Exhau 103 ATDC 109 200 260 2 PIDC 50	Ist Profile BTDC	Overall Cam Specs Total Cam Advance 3.0 Advance Lobe Separation, 106.0
# Total Coils 5.4 # Active Coils 3.4 # Inactive Coils 2	Upen @ .U5U ", BTDL Close @ .050 ", ABDC Max Lobe Lift, in Actual Valve Lash, in	-3 BIDC 59 23 Click here for th -3 Lice -9 -020 .02	ne screen be	Lift for Rating Events .050 inches
Small End O.D. in	Designed Val	Train Dynamics Specs for:		Calc Eff Valve Mass, gms
Std Spring Steel Yes Youngs Mod. psi E6 Poissons Ratio Density Ib/cu in 1 Aspect Ratio ? Installed Ht, in 1.8 Retainer Step, in Clin Open Ht, in 1332 Installed Force, Ib 579.7	Rocker Arm F Intake Lifter (profile) Valve T Choose a 'Spec' F Type to enter Ra Eff Valve Gross Valve I Eff Valve Dwell Over N Eff Lifte Duration @.: Eff Rev Ck here for the screen to Pick Intake Base Ci Crown F Crown F	Valve Train Specs rain Type Pushrod & Rocker re Mass, gms 60 Kit Mass, gms 10 Kit Mass, gms 10 the right. 1.1 Radius, in 500.00	Arm	E Calc Eff Valve Mass, gms 189. V Component Weights V Valve Weight, gms 134 Retainer + Locks, gms 18 Spring + Damper, gms 55 Rocker Arm wo Fulcrum, gms 95 Spring Type Tapered Hotes: Enter the weights of components which are controlled by 1 valve spring. For example, on 4 valve beads, you enter the weight of just 1 valve
Upen Porce, ID 1294. Bind Ht, in 11 Nat Freq 10 Nat Freq, CPM 62 Bind Stress, psi 39 These Notes explain h valve spring retainer. smaller that the weigh you must both choose actual Retainer + Lock	lere you can tell the soft apered or beehive. If the o the spring pack, the pr prings are on the same now you should enter the The program will not as t you enter. So to simul Tapered as the Spring ks weight, which is typica	ware that your spring is ere are multiple springs ogram assumes all Type. ••••••••••••••••••••••••••••••••••••		retainer, and valve spring, because each valve has its own valve spring. If the Spring Type is not 'Cylinder', the program only adjusts the spring mass's contribution to the Valve Mass. You will have to enter the actual weight of the retainer, which is typically smaller and lighter for Tapered or Beehive springs. Use Calc Value Help Cancel Print Fig 12

Plus Version, Detailed Graphs:

If you do a Cam Hamonics/Analysis, the Plus version lets you do more detailed graphs. See the screen sections below and on the next screen to see how to get to these more Detailed Graphs.







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