

How to Create Sine Wave Cylinders in a Ring

In this article, you'll learn how to create Sine Wave Cylinders in a Ring, for the most part properly oriented (with small compromises), such as the picture below for 24 cylinders oriented at 90 degrees in a ring. Become familiar with the...

Part 1 of 3:

The Tutorial

- If you have completed the article and workbook Create a Ring of Sinewave Spheres in Excel, you may do a SAVE AS of that file under a new appropriate title for this project and save quite a bit of time, though there are a number of modifications and some new additions.** Otherwise, create a new Excel workbook with three worksheets: DATA 01, CHART (unless using Chart Wizard) and SAVES
- Set Your Preferences:** Open Preferences in the Excel menu and follow the directions below for each tab/icon.
 - In General, set *R1C1* to Off and select *Show the 10 Most Recent Documents* .
 - In Edit, set all the first options to checked except *Automatically Convert Date System* . Set *Display number of decimal places* to blank (as integers are preferred). Preserve the display of dates and set 30 for 21st century cutoff.
 - In View, click on show *Formula Bar* and *Status Bar* and hover for *comments of all Objects* . Check *Show gridlines* and set all boxes below that to auto or checked.
 - In Chart, allow *Show chart names* and set *Data markers* on hover and leave the rest unchecked for now.
 - In Calculation, Make sure *Automatically* and *Calculate before save* is checked. Set max change to .000,000,000,000,01 without commas as goal-seeking is done a lot. Check *Save external link values* and *Use 1904 system*
 - In Error checking, check all the options.
 - In Save, select *Save preview picture with new files* and *Save Autorecover* after 5 minutes
 - In Ribbon, keep all of them checked except *Hide group titles* and *Developer* .
- It helps placing the cursor at cell A16 and doing Freeze Panes.** Edit Go To cell range A1:J17288 and Format Cells Number Number Decimal Places 4, Font Size 9 or 10, Fill (from the color wheel) a nice fuchsia and make the Border Dark Blue bold Outline.

4.

Sine Wave Cylinders in a Ring										Line	ARC	30.0000	Stretch_x1	Stretch_x2	R2085	17288.0000	0.0100	1.0000	1.0000	1.0000
Radius	HEI	0.4000	38250.0000	382.5000	MAGRC	720.0000	Axis	Axis	Sign(GCOS(DI	Sign(SIN(DI										
Height	CR	0.2500	Stretch	0.0100	SPHERES	24.0000		90.0000	DEGREES											
7.5000	7.5000																			
7.5000	17.0000	1.0000	0.6700	0.0000	0.2500	7.5000	17.0000	8.2650	37.4781	0.0000	1.0000	0.0000	1.0000							
7.5000	17.0007	1.0000	0.6700	0.0007	0.2415	7.5000	17.0027	8.2650	37.4732	1.0000	1.0000	0.0000	1.0000							
7.5000	17.0055	0.0000	0.5000	0.0175	0.2335	7.5000	17.0027	8.2648	37.4801	1.0000	1.0000	0.0000	1.0000							
7.5000	17.0083	0.0000	0.8100	0.0262	0.1788	7.5000	17.0027	8.2647	37.3808	1.0000	1.0000	0.0000	1.0000							
7.5000	17.0109	0.0000	0.2100	0.0349	0.1290	7.5000	17.0027	8.2645	37.2885	4.0000	1.0000	0.0000	1.0000							
7.5000	17.0136	0.0000	0.7900	0.0436	0.0847	7.5000	17.0027	8.2643	37.1998	1.0000	1.0000	0.0000	1.0000							
7.5000	17.0164	0.0000	0.8900	0.0524	0.0000	7.5000	17.0027	8.2640	37.0428	1.0000	1.0000	1.0000	1.0000							
7.5000	17.0191	0.0000	0.3900	0.0611	-0.0647	7.5000	17.0027	8.2638	36.9257	7.0000	1.0000	1.0000	1.0000							
7.5000	17.0218	0.0000	0.7800	0.0698	-0.1250	7.5000	17.0027	8.2633	36.8170	8.0000	1.0000	1.0000	1.0000							
7.5000	17.0245	0.0000	0.5000	0.0785	-0.1788	7.5000	17.0027	8.2631	36.7347	9.0000	1.0000	1.0000	1.0000							

Enter the upper Defined Name Variables Section (here's a picture):

1. A1: Aligned left, enter Sinewave on Cylinders in a Ring and Format Font Apple Chancery or something fancy and nice?
 2. NEW: D1: Lines
 3. NEW: D2: Radius
 4. NEW: D3: Height
 5. E1: AYE
 6. E2: BEE
 7. E3: CEE
 8. MODIFIED: F1: 30
 9. MODIFIED: F2: .40
 10. MODIFIED: F3: .25
 11. Select cell range E1:F3 and Insert Name Create in Left Column, OK.
 12. MODIFIED: G1: Stretch_x1
 13. MODIFIED: G2: Enter w/o quotes the formula " $= (8.5 * (\text{SHRINKER} * 10)) * \text{Degrees} / \text{VLOOKUP}(\text{Degrees}, \text{D_Lookup}, 2)$ "
 14. MODIFIED: H1: Stretch_y1
 15. MODIFIED: H2: Enter w/o quotes the formula " $= (8.5 * (\text{SHRINKER} * 10)) * \text{Degrees} / \text{VLOOKUP}(\text{Degrees}, \text{D_Lookup}, 3)$ "
 16. Select cell range G1:H2 and Insert Name Create in Top Row, OK.
 17. G3: Shriner
 18. H3: Enter w/o quotes the formula " $= 0.1 * 12 / \text{SPHERES}$ " and Insert Name Define Name Shriner to cell \$H\$3.
 19. I1: ROWS
 20. J1: " $= 17285 - 5$ "
 21. I2: MAGIC
 22. MODIFIED: J2: Enter w/o quotes the formula " $= \text{ROUND}(J1 / \text{SPHERES}, 0)$ "
 23. I3: SPHERES
 24. MODIFIED: J3: 24 for now.
 25. Select cell range I1:J3 and Insert Name Create in Left Column, OK.
 26. NEW: K1: Enter w/o quotes " $= \text{IF}(\text{ABS}(\text{ROUND}(\text{COS}(\text{Degrees} * \text{PI}() / 180), 5)) > 0.1, 0.01 * M1, \text{COS}(\text{Degrees} * \text{PI}() / 180))$ "
 27. NEW: L1: Enter w/o quotes " $= \text{IF}(\text{ABS}(\text{ROUND}(\text{SIN}(\text{Degrees} * \text{PI}() / 180), 5)) > 0.1, 0.01 * N1, \text{SIN}(\text{Degrees} * \text{PI}() / 180))$ "
 28. NEW: K2: Ajx1_
 29. NEW: L2: Ajy1_ and select cell range K1:L2 and Insert Name Create Names in Bottom Row, OK.
 30. NEW: L3: 90 and Format Font size 14.
 31. NEW: M3: Degrees and Format Font Size 14. Select L3:M3 and Insert Name Create Name Right Column, OK.
 32. NEW: M1: Enter w/o quotes " $= \text{SIGN}(\text{COS}(\text{Degrees} * \text{PI}() / 180))$ "
 33. NEW: N1: Enter w/o quotes " $= \text{SIGN}(\text{SIN}(\text{Degrees} * \text{PI}() / 180))$ "
 34. NEW: M2: Sign(Cos(D)) and N2: Sign(Sin(D))
 35. NEW: Format A1:N5 Format Cell Alignment Center Horizontal and otherwise follow the formatting shown in the picture if you please, especially the bright yellow fill for degrees. Note: "SPHERES" really refers to CYLINDERS. It should have been changed.
- 5. Enter the column headings of rows 4 and 5:**
1. NEW: A4: Enter w/o quotes " $= \text{Degrees} / \text{IF}(\text{SPHERES} >= 18, \text{SPHERES}, 6) * \text{SPHERES} / 12$ "
 2. NEW: B4: Enter w/o quotes " $= \text{Adj_Cos}$ "
 3. A5: Adj Cos (for Adjusted Cosine)

4. B5: Adj Sin and select cell range A4:B5 and Insert Name Create Names in Bottom Row, OK.
5. C5: Indicator
6. D5: Randy (for RandBetween)
7. E5: t: 0 to n?
8. F5: z1_
9. NEW: G4 and H4: Randomized with Strikethrough Font
10. G5: Adj_x1
11. H5: Adj_y1
12. I4 and J4: Charting
13. MODIFIED: I5: x: Mostly w/ z
14. MODIFIED: J5: y: Mostly w/ z
15. Command+Select cells F1:F3 and I3 and Format Fill yellow.
16. Select cell J3 and Format Fill sky blue from the color wheel.
17. Select cell range I4:J5 and Format Font italic.
18. Select cells A4:B4 and Format Fill white (varies with picture's yellow).
6. **NEW:** Enter the D_Lookup table for looking up degree relations around the axes where cosine or sine go to zero.
 1. K4: Enter D_Lookup
 2. K5: Degrees
 3. L5: WidthAdj
 4. M5: HeightAdj
 5. N5 BOTHAdj
 6. Edit Go To cell range K6:K366 and enter 0 into K6 and do Edit Fill Series Column Linear Step Value 1, OK. Format Cells yellow with Border red bold Outline each.
 7. Copy cell K7 and paste it to cell range L6:N366.
 8. In the WidthAdj or X column, change from 1 to .01 to following range: L91:L101 and format fill light blue. Also change from 1 to .01 for cell range L270:L281 and format fill light blue. These may need further adjustment.
 9. In the HeightAdj or Y column, change from 1 to .01 cell range M6:M11 and format fill light blue. Also change from 1 to .01 cell range M181:M191 and format fill light blue. Lastly change from 1 to .01 cell range M361:M366 and format fill light blue. These are where the axes are vertical or horizontal and the cylinders tend to become straight lines otherwise, plus and minus the 5 surrounding degrees. The BOTHAdj column was used as a temp get-by while discovering the values that worked best. YOU may wish to refine the approach, so BOTHAdj was left in.
 10. Edit Go To cell range K6:N366 and Insert Name Define Name D_Lookup to cell range \$K\$6:\$N\$366.
7. **Enter the column formulas:**
 1. MODIFIED: Adj Cos: Edit Go To cell range A6:A17285 and enter into A6 w/o quotes the following formula, " $=Adj_Cos * \cos((ROW()-6) * 0.25/12 * \pi()/180)$ " and Edit Fill Down.
 2. MODIFIED: Adj Sin: Edit Go To cell range B6:B17285 and enter into B6 w/o quotes the following formula, " $=Adj_Sin * \sin((ROW()-6) * 0.25/12 * \pi()/180) + 17$ " and Edit Fill Down.
 3. Indicator: Select cell C6 and enter 1. Edit Go To cell range C7:C17286 and enter w/o quotes the formula, " $=IF((ROW()-7)/MAGIC=INT((ROW()-7)/MAGIC),1,IF((ROW()-7)=0,1,0))$ " and Edit Fill Down.
 4. MODIFIED: Randy: Edit Go To cell range D6:D17286 and enter into D6 w/o quotes the following formula, " $=RANDBETWEEN(0,100)/100$ " and Edit Fill Down. Edit Go To cell range D6:D17285 and Insert Name Define Name Randy to cell range \$D\$6:\$D\$17285.

5. t: 0 to n?: Select cell E6 and enter 0. Select cell E7 and enter the formula `"=(2*PI()/MAGIC)".` Edit Go To cell range E8:E17285 and enter w/o quotes into E8 the formula `"=IF(C8=1,2*PI(),2*PI()/MAGIC+E7)"` and Edit Fill Down.
6. z1_: Edit Go To cell range F6:F17285 and enter w/o quotes into F6 the formula `"=CEE*COS(AYE*E6)"` and Edit Fill Down. Edit Go To cell range F6:F17285 and Insert Name Define Name z1_ to cell range \$F\$6:\$F\$17285.
7. Adj_x1: Edit Go To cell range G6:G17285 and enter w/o quotes into G6 the formula `"=IF(C6=1,A6,G5)"` and Edit Fill Down. Edit Go To cell range G6:G17285 and Insert Name Define Name Adj_x1 to cell range \$G\$6:\$G\$17285.
8. Adj_y1: Edit Go To cell range H6:H17285 and enter w/o quotes into H6 the formula `"=IF(C6=1,B6,H5)"` and Edit Fill Down. Edit Go To cell range H6:H17285 and Insert Name Define Name Adj_y1 to cell range \$H\$6:\$H\$17285.
9. MODIFIED: x: Mostly w/ z: Edit Go To cell range I6:I17285 and enter w/o quotes into I6 the formula `"=SPHERES/12*(SHRINKER^2*(Stretch_x1*((BEE*COS(E6))+z1_*IF(OR(AND(Degrees>=85,Degrees<=185),AND(Degrees>=265,Degrees=275)),0,1)))*Ayx1_)+G6"`
10. MODIFIED: y: Mostly w/ z: Edit Go To cell range J6:J17285 and enter w/o quotes into J6 the formula `"=SPHERES/12*(SHRINKER^2*(Stretch_y1*((BEE*SIN(E6))+z1_*IF(OR(Degrees=5,AND(Degrees>=185,Degrees=185),AND(Degrees>=355,Degrees=360)),0,1)))*Ajy1_)+H6"`
11. Select cell I17286 and enter the formula w/o quotes `"=I6"` and select cell J17286 and enter the formula w/o quotes `"=J6"`. This makes the top connecting line from the last sphere to the first.
12. H17287: Enter MAX and cell H17288: enter MIN.
13. I17287: Enter w/o quotes `"=MAX(I6:I17285)"` and cell I17288: enter w/o quotes `"=MIN(I6:I17285)"`. Copy I17287:I17288 and Paste Special Formulas to J17287:J17288. This will greatly help making chart adjustments since good detail is had at these limits. In general, it helps to round up a small bit.
14. Edit Go To cell range I6:J17288 and do Format Fill sky blue.
15. Select cell D5 and Format Fill light sea green, font red, Border navy blue outline bold. Then do Edit Paste Special Format of D5 to cell C6, E6, E7, I17286, J17286, I5 and J5 to make distinct the format of those cell's formulas/values.

Part 2 of 3:

Explanatory Charts, Diagrams, Photos

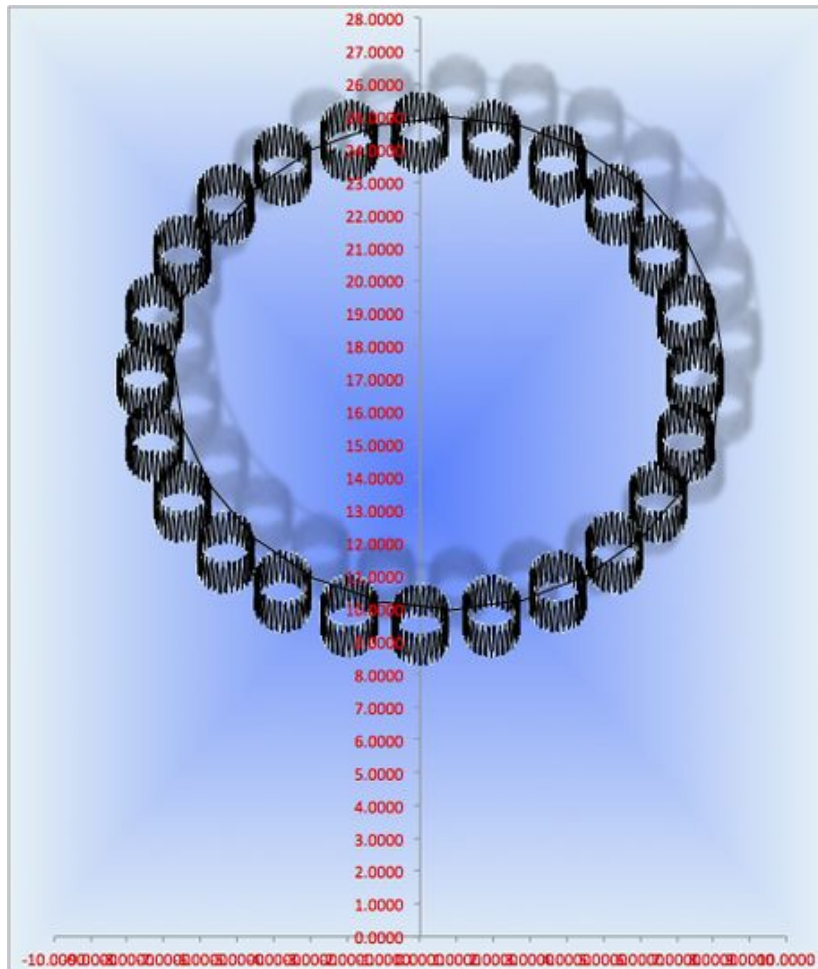
1. (dependent upon the tutorial data above)

1. Create the Chart:

1. Edit Go To cell range I6:J17286 and from the Ribbon or Chart Wizard select Charts All/Other Scatter Smoothed Line Scatter and Copy or Cut the chart that is atop the data worksheet and paste it to the top left of the Chart worksheet. Hover over the lower right corner until the cursor becomes a double-headed arrow and pull it open to become a large approximate square. You may very well have to adapt the axes for special situations like degrees = 5.
2. Click in the Plot Area and select Chart Layout from the ribbon and at far left under Current Selection select Series 1, then under that, Format Selection. Set Line to Black, Smoothed line, Weight = 1 pt. and Dashed = Solid. Set Shadow to checked Outer 45 degrees, black, Size 100%, Blur 4 pt, Distance 30 pt, Transparency 75 %. Set Glow to very light blue Size = 1 pt. 2%

- transparency, Soft Edges 0 pt. OK.
3. Do Current Selection under Chart Layout as Plot Area, Format Selection. No Line, No Glow and No Shadow. Set Fill to No. Gradient to None. 3-D is all zeros. OK.
 4. Do Current Selection under Chart Layout as Chart Area, Format Selection. Fill Gradient color Prussian Blue I think they call it on left 0% to Light Blue on right 100%, Path, 0 degrees, Transparency 0%. Line = Auto. Shadow is Unchecked/ No Glow or Soft Edges. 3-D Format is not set. OK.
 5. Set axes to Font 9, color red, and a MIN MAX formula at the bottom of the data worksheet helps quite a bit in setting the chart parameters for columns I and J.

2.



24 SW Cylinders in a Ring
Finished!

Part 3 of 3:

Helpful Guidance

1. Make use of helper articles when proceeding through this tutorial:

1. See the article How to Create a Spiralic Spin Particle Path or Necklace Form or Spherical Border for a list of articles related to Excel, Geometric and/or Trigonometric Art, Charting/Diagramming and Algebraic Formulation.

2. For more art charts and graphs, you might also want to click on [Category:Microsoft Excel Imagery](#), [Category:Mathematics](#), [Category:Spreadsheets](#) or [Category:Graphics](#) to view many Excel worksheets and charts where Trigonometry, Geometry and Calculus have been turned into Art, or simply click on the category as appears in the upper right white portion of this page, or at the bottom left of the page.

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