Drum Designing

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Link to this SSA

https://www.overleaf.com/read/yngdzxhwgpzn#e9ab38

Goals

- To design different types of drum designs for the launching mechanism in Siemens Nx

Summary

With the initial guidance of Sem, two drum designs were realized in NX.

1 Elaboration

1.1 Discussion

After the meeting, discussions were held with Sem to understand how he made his drum design. We also discussed what exactly could/should be changed after the first testing in protozone. We came to the conclusion that the 1m long arm rotated significantly slowly we would definitely benefit from a drum that was smaller in diameter. We also came to the conclusion that the grooves needed to be deeper to hold the string better so that rewinding the drum becomes easier.
There are multiple approaches to the design of the drum itself as well, I chose to first make a drum that gradually decreased in diameter (from 30mm to 15mm compared to the original drum ranging from 60mm to 30mm)
I also designed a drum that did not have any slant/change in diameter, ie; a cylinder of diameter 15mm with grooves for the string.

1.2 Drum Design 1 (Slanted)

To design this drum, first a sketch of the x-z cross-section was made (as shown in figure 1 below);

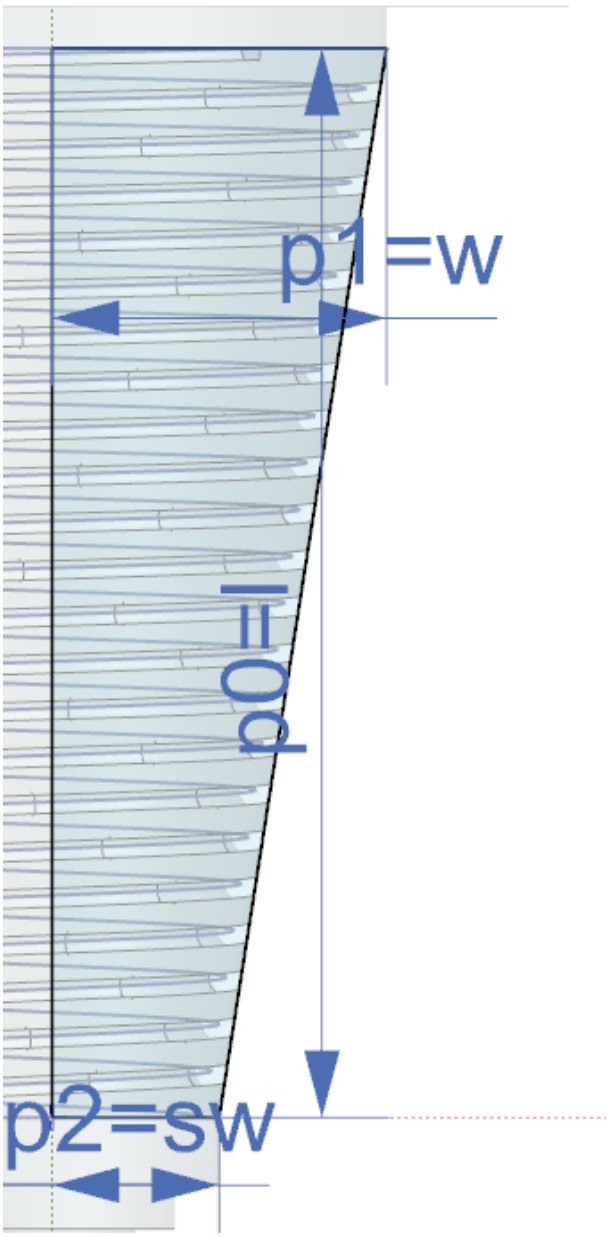

Figure 1: X-Z Cross Section of Drum

Here, w is the maximal radius of the drum, sw is the shortest, ie; the final radius of the drum, and l is the length/height of the drum. The numerical dimensions aren't specified here explicitly because they are subject to change. The CAD files to the drum can be accessed to obtain the numerical values.
The sketch is then revolved around the Z-axis, which gives 2

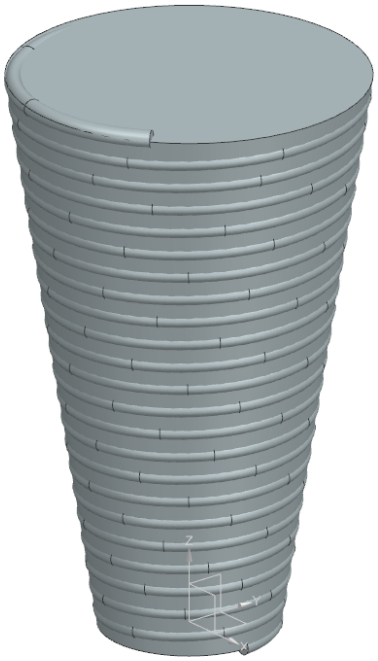

Figure 3: After Helix and Tube Function

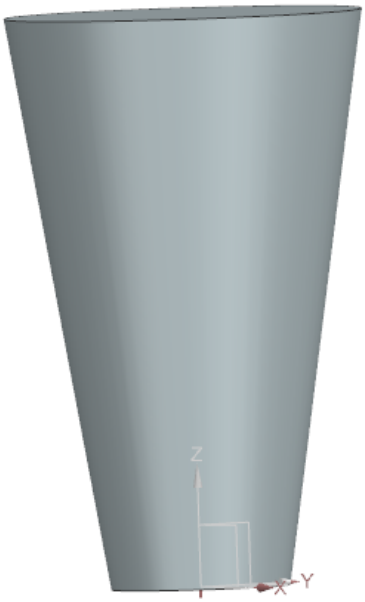

Figure 2: After Revolving

Adding a helix function as a curve, and then using the tube along the helix curve gives**??**:

Once the tube is defined, it is just a matter of performing a boolean operation of subtracting the tube from the drum to obtain the necessary grooves for the drum 4. It is important to note that the grooves of this drum are deeper than the original drum used in the first test (As mentioned in the above subsection).

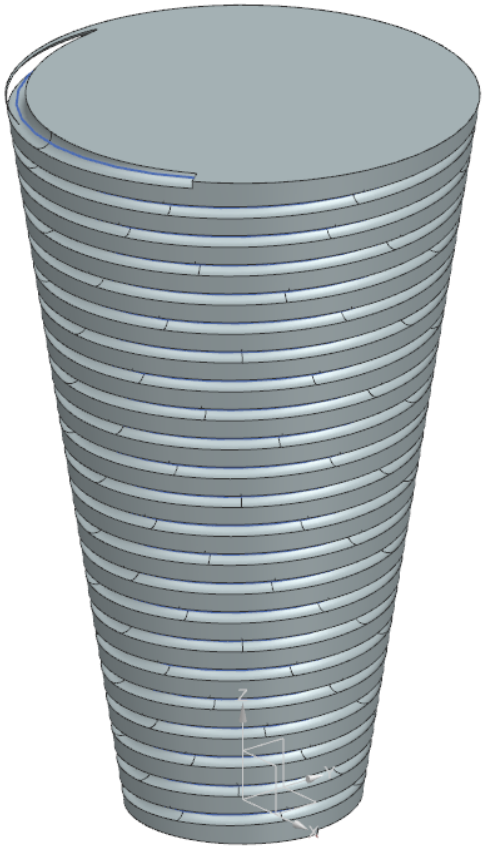

Figure 4: Drum with grooves

Now, the majority of the drum was completed. Minor details such as the pins on the bottom were added to allow the attachment of the drum to the bearings 5

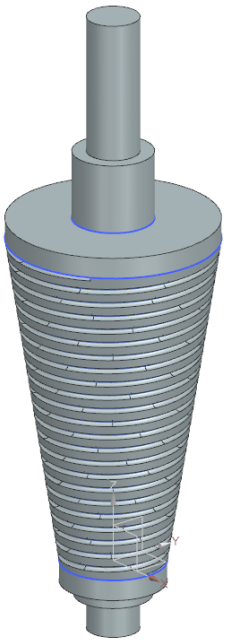

Figure 5: Slanted Drum

However, later on, after discussion with Sem, it was deemed that the pins at the bottom of the drum were of no use at this stage. The whole drum part could be printed as one. Later, if we would like to switch out drums more easily, we can employ the pin mechanism.

1.3 Drum Design 2 (Cylindrical)

Designing this was much more straightforward, since the shape is regular and most of the work done with the previous design could be reused.
The first/initial sketch was edited as required 6:

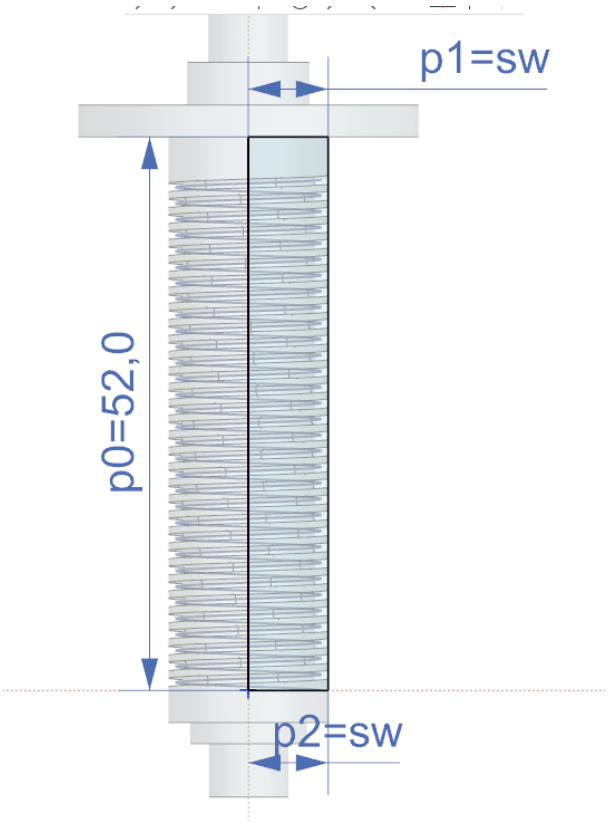

Figure 6: Initial Sketch

Then, it was just a matter of editing the helix so that it followed the curvature of the new cylindrical surface. Once that was done, the tubing (grooves) were edited accordingly. The rest of the drum was the same and hence it was reused. 7

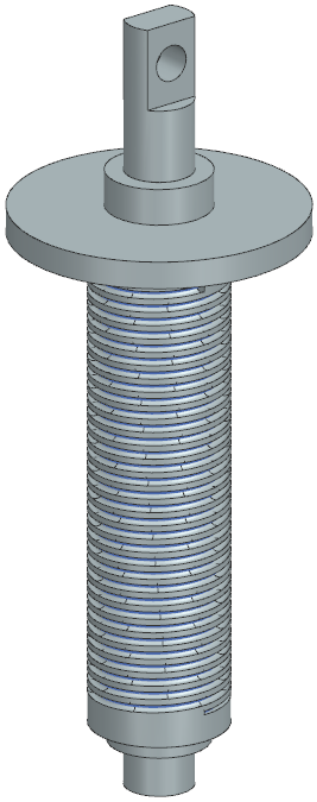

Figure 7: Final Result, Drum 2

It is important to note that the attachment made to the top of the drum (seen in figure 7) was made by Sem for this drum as well as the first drum