

Memo

To: Armin Eilaghi

CC: Connor R Gaudette

From: Kaitlyn Redman

Date: 12 September 2025

Subject: Self-Learning Assignment: Hand Winding a Delta Configuration on a 3 Phase Motor

Introduction

This memo documents my self learning experience this semester in developing the skill of winding a three phase motor stator in a delta configuration by hand. I selected this skill because it is a central component of our generator project. The generator cannot function without properly wound coils, since the coils are responsible for producing the induced electromotive force (EMF) that generates power. My goal during this self learning process was to build both the technical ability to wind coils and the design attributes required to translate theory into a practical, working system.

Skill Learned and Design Attributes Developed

The skill I chose to learn this semester was hand winding a delta configuration in a three phase motor. This process requires not only technical accuracy but also an understanding of how electrical connections influence generator performance. By practicing winding, I developed several important attributes of engineering design.

First, I improved my precision, since each coil must contain an accurate number of turns to ensure balance in the electrical loading across the three phases. Second, I strengthened my problem solving ability, as I encountered challenges with tight coil placement and keeping wires secured during winding. Third, I engaged in iterative prototyping, using a 3D printed model of

our stator to refine my techniques before attempting to wind the actual stator. Finally, the process increased my awareness of manufacturability, as I learned to recognize the difference between an ideal theoretical delta connection and the practical steps required to produce it by hand. Together, these attributes are critical for bridging the gap between design intent and successful fabrication.

Self Learning Process and Evidence of Training

My self learning process combined three elements: research, note taking, and hands on practice. To begin, I studied a series of YouTube tutorials and a technical article that explained the fundamentals of winding in a delta configuration and demonstrated practical winding methods [1]–[5]. These resources provided me with demonstrations, troubleshooting advice, and insights into common mistakes that beginners encounter.

From these materials, I took detailed notes that I could refer back to during practice. Some of the most useful tips included:

- Defining “one turn” consistently to avoid confusion and maintain accurate coil counts.
- Considering the use of a 3D printed winding jig to keep coil sizes uniform.
- Applying epoxy or string to secure coils neatly after winding is complete.
- Properly connecting phases A to B, B to C, and C to A while labeling each phase for clarity.

These notes reflect how I translated theoretical instruction into a practical checklist I could follow. They also demonstrate the structured approach I used to guide my self learning, moving from observation to recording, and finally to application.

Application of Skills and Project Impact

After completing my research, I applied these lessons on a 3D printed model of our stator. This model provided a low risk environment to practice winding techniques without wasting copper wire or damaging the real stator. Working on the model helped me develop my own strategies, such as keeping tension on the wire to form tight, even coils and finding easier ways to guide the wire around each stator arm.

Figures 1 and 2 illustrate the early stages of this practice process. Figure 1 shows the beginning of the winding process, while Figure 2 demonstrates the completion of one full phase (Phase A). These early attempts were essential in building confidence and uncovering mistakes before I moved on to the real stator.

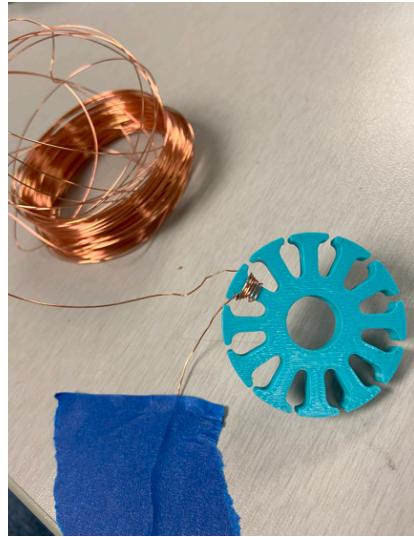


Figure 1: Beginning of the Winding Process

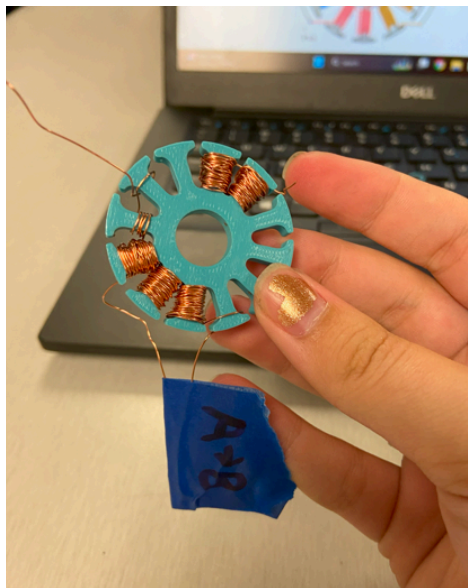


Figure 2: One Complete Phase (A)

Even though the real stator is still in the manufacturing stage, I was able to complete a full practice winding on the 3D printed model. Figure 3 shows the finished result, with all three phases wound and connected in a delta configuration. This practice session was valuable in showing me what the finished product should look like and highlighted areas I can improve on when winding the real stator.

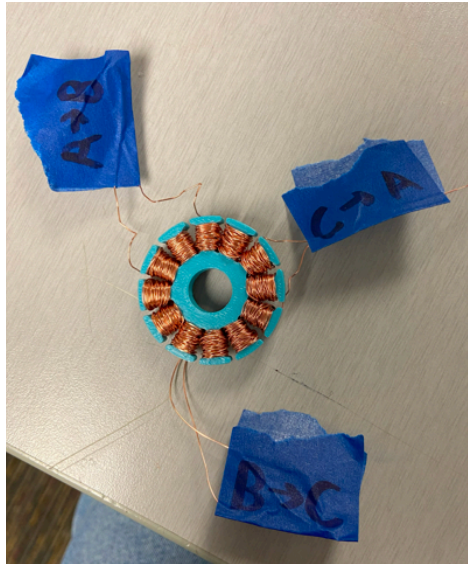


Figure 3: Completed Practice Wind

Through this process, I am confident in the ability to wind the coils on our actual stator once it becomes available. This is a major step in the manufacturing process of our generator and represents a tangible outcome of my self learning efforts.

Conclusion

Learning how to hand wind a three phase stator in a delta configuration has been an important step in my development as both a student and an engineer. This skill not only supports the practical needs of our generator project but also developed critical attributes of engineering design such as precision, problem solving, prototyping, and manufacturability. By combining research and hands-on practice with a 3D printed model, I successfully trained myself in a new technical ability and gained confidence to perform this task on the real stator. This experience

highlights the value of self directed learning and demonstrates how independent skill building can directly contribute to the success of an engineering project.

References

- [1] The Electrical Guy. “Learn Practically How to Check Motor with Insulation Tester.” YouTube. 11 Mar. 2024. [Online Video]. Available:
https://www.youtube.com/watch?v=BD7_7a77m4M. [Accessed: 26 Aug. 2025]
- [2] Basic Electric BD. “3 phase motor winding connection tutorial / star delta connection, from basic electric bd I.” YouTube. 26 Feb. 2021. [Online Video] Available:
<https://www.youtube.com/watch?app=desktop&v=nwzd8TaW1YI>. [Accessed: 26 Aug. 2025]
- [3] Gibbons Engineering Group. “How to rewind an electric motor from start to finish.” YouTube. 4 Sep. 2023. [Online Video]. Available:
<https://www.youtube.com/watch?v=XRYSFalqe2U>. [Accessed: 26 Aug. 2025]
- [4] The Engineering Mindset. “Star Delta Starter Explained - Working Principle.” YouTube. 30 Jun. 2019. [Online Video]. Available:
<https://www.youtube.com/watch?v=h89TTwlNnpY&t=120s>. [Accessed: 1 Sep. 2025]
- [5] Understanding delta-wound three-phase motors for industrial applications - technical articles, <https://control.com/technical-articles/understanding-delta-wound-motors/> (accessed Sep. 1, 2025).