2023 TEEP 高效率馬達, 綠能科技, 數位學習教材 學習成果報告書

1. 計畫摘要：

(1)計畫簡介：

越南胡志明工業大學電機工程學院和外國語文學院共有六名大四學生參加了本次計畫。在台期間的研究主題由兩所大學的指導教授共同指導。在宜蘭大學實習的一個月，主要的學習與生活適應措施包括：學伴的安排、專業技能的學習與發展、台灣產業交流、文化交流與體驗、參加高效率旋轉式壓縮機馬達設計競賽等。為加強與姊妹校的聯合教學並且為兩校學生建立共同學習的環境，這個跨國、跨校、跨系的團隊由宜蘭大學機械與機電工程學系學生 11 名、教授 2 名、外國語文學系學生 1 名以及胡志明市工業大學的教授和六名學生組成。目的為進行人才培育、共學共授、各類研究及技術資源整合。並且參加 2023 高效率旋轉式壓縮機馬達設計比賽。

(2) 計畫日期:

2023/02/16~2023/03/16

(3) 地點:

先進動力與能源實驗室(APEC), 機械與機電工程學系, 國立宜蘭大學

(4) 執行:

a. 參加 APEC 內部訓練課程：包含基礎外語及專有名詞學習、單相感應馬達設計、SolidWorks、RMxprt、電機工程概論。

b. 研究主題: 根據 TEEP 成員的專業背景，參與的學員在先經過一週的基本訓練，與 APEC 指導教授討論後，確定了研究主題。學習的主題包含高效率旋轉式壓縮機馬達設計、單相工業馬達設計、成本分析、效率分析。 這些主題也將作為未來雙邊合作的研究方向以及來宜蘭大學攻讀碩士學位的 TEEP 學生之學習基礎。

c. 學生成果展示：來到 APEC 的 TEEP 成員之研究成果將參加高效率旋轉式壓縮機馬達設計競賽，並在瑞智公司進行展示，藉此增強學生的表達能力、自信心和成就感。

d. 產業參訪：透過與台灣企業的互動，增進 TEEP 學生對台灣教育、工業、經濟、文化的了解。期待將台灣視為亞洲經濟貿易發展及未來學位學習的首選合作夥伴。

e. 英語教學與報告：TEEP 2023 有三位來自外國語文學系的成員。在課程期間，三人不僅在壯圍國中開設英語課，還在不同學校、不同公司進行了多次演講。此外，整個計畫以英語作為主要的溝通語言。

參加學員在瑞智公司進行簡報

(5) 計畫成員:

我們從越南胡志明工業大學電機工程學院和外語學院招收了六名學生。他們分別是 Tran Nhat An, Cung Phuong Uyen, Tran Quoc Thinh, Nguyen Nhat Hoang Anh, Le Quoc Viet, Nguyen Pham Minh Tan.

參加學員和實驗室學生合照

(6) 經費報告

TEEP@AsiaPlus Financial Report		
姓名	停留期間(月)	補助
Tran Nhat An	1	15,000
Cung Phuong Uyen	1	15,000
Tran Quoc Thinh	1	15,000
Nguyen Nhat Hoang Anh	1	15,000
Le Quoc Viet	1	15,000
Nguyen Pham Minh Tan	1	15,000
總計		90,000

2. 學習成果

(1)計畫回顧影片:

https://www.youtube.com/watch?v=MjOqt7nhd3k

(2)計畫成員之學習成果:

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	NGUYEN NHAT HOANG ANH		nnhoanganh1010@gmail.com
	NGUYEN PHAM MINH TAN		iuhnguyenphamminhtan@gmail.com
	TRAN NHAT AN		tranan26092000@gmail.com
	TRAN QUOC THINH		tranquocthinhdhdktd15c@gmail.com
指導教授	Dr. Cheng-Hu Chen, Dr. Phan Thi Tuyet Nga		
主題	高效率旋轉式壓縮機馬達設計競賽		

研究過程

簡介:

近年來，受到新冠疫情和原材料上漲的影響，馬達使用的銅線價格持續飆升，尋找替代品成為產產重要的課題。由於鋁線的價格是銅線的四分之一，如何取代銅線改用鋁線在家用電機的應用，為本次 TEEP 團隊的研究主題。我們將這項研究分成三個團隊，分別是 16 槽、20 槽和 24 槽。 每個團隊必須由 NIU APEC、IUH FEET 和 IUH FFL 的學生共同組成。

感應馬達定子中最重要、最複雜的參數是線徑的匝數，我們分析了現有數據，建立了線徑與匝數的初始設計參數。由於單純調整線徑與匝數無法達到設計目標，因此我們進一步改變了

定子的槽型和內徑。此外槽型和內徑的變化也會影響線徑匝數的銅線用量，並進一步影響成本和損失的分佈。

成果：

此專案的主要貢獻包括三個主要部分：

(1) APEC, NIU 和 FEET, IUH 的學生都可以透過分析現有資料找到初始資料。此外，參加學員可以知道如何調整這些參數以獲得最佳的馬達設計。

(2)找到的數據不僅提高了效率，也降低了成本，達到了目標值，有些參數甚至優於目標值。

(3) APEC, NIU 和 FEET, IUH 的學生都獲得了與來自不同國家、講不同語言的人一起工作的能力，參加的學員可以互相合作並成功完成專案。

最後所有不同國家及背景的學員都參加了高效率旋轉式壓縮機馬達的設計競賽；20 槽之團隊獲得金牌(獎金 NTD5000)、16 槽之團隊獲得銀牌(獎金 NTD3000)、24 槽之團隊獲得銅牌(獎金 NTD2000)。對於宜大學生和 TEEP 學員來說，這是值得開心的一刻。

CUNG PHUONG UYEN:

外文系學員與碩士班課程學員討論

During my internship, I was given the unique opportunity to become an English teaching assistant for

Non-Native English-Speaking Students in Monday's English classes, which were led by Prof. Chen and his co-teacher, Prof. Phan. As part of their three-year development of Massive Open Online Courses (MOOCs), I also contributed to my online internship program at APEC by designing teaching activities for lesson plans, editing teaching videos, and becoming a teaching assistant. In addition, I was responsible for creating book contexts and ensuring the information was properly ordered for the development of the course books that would improve the efficiency of the courses.

Through TEEP 2023, I was able to meet and collaborate with students and professionals from other countries, which helped me develop my interpersonal and communication skills. This experience has also allowed me to expand my professional network and opened up opportunities for future collaborations.

LE QUOC VIET:

外文系學員在壯圍國中開設英文課

In the first two weeks in NIU, the TEEP members and I learned about the motor's fundamental parts and essential steps to draw the part of the motor such as the stator and the rotor. Then, we were provided with materials and were carefully instructed by APEC's students on how to utilize SOLIDWORKS, and ANSYS software to actually draw the parts of the motor. The students from the Faculty of Electrical Engineering Technology (or FEET) at the Industrial University of Ho Chi Minh City worked closely with students from APEC, NIU with the help of FFL's

students. At first, the teamwork progress was not easy due to the language barrier, but every student did their best to express ideas and thoughts, so everything went smoothly after that. In conclusion, it is safe to say that the communication issues between the two sides were solved successfully, and we are very proud of our achievement.

The three members of the FFL were lucky to have the chance to teach at Zhuangwei Junior Highschool, as well as have the chance to introduce our beloved country and university to National Lotung Industrial Vocational High School, and in NIU's classes. These were such amazing and valuable experiences that we had during our stay in Taiwan.

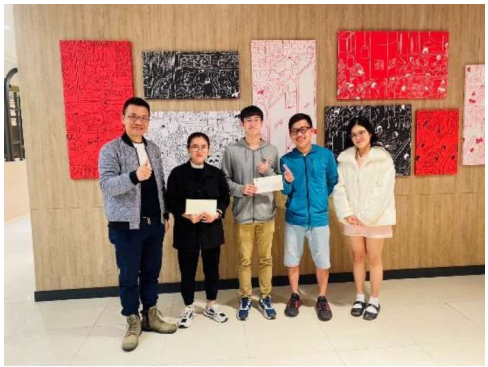
TRAN NHAT AN:

外文系學員與壯圍國中學生互動

Through this TEEP program, I not only had a chance to experience teaching English at local high schools but also took the responsibility of enhancing engineering students' English communication skills and raising their awareness of the importance of the language in the multi-national working environment. With such visions, Prof. Chen assigned me to be an English assistant for his co-teaching English class with Prof. Phan - Vice-dean of the Faculty of Foreign Languages (FFL), Industrial University of Ho Chi Minh City (IUH) every Monday night, and to assist Taiwanese and Vietnamese students in cooperating to participate in a motor design contest. Moreover, I also played a role as a bridge to connect Taiwanese companies with the Vietnamese market by delivering presentations to those companies' managers.

NGUYEN NHAT HOANG ANH:

During my four-week internship program, I gained extensive knowledge about motors and their parameters, which included learning how to use motor design software. On top of that, I wrote a comprehensive report in English detailing the process of drawing a 20-slot stator and a 26-slot rotor using SolidWorks and Ansys. This report was an essential component of our project for the "2023 High-Efficiency Rotary Compressor Motor Design Contest", with the topic of optimally designing a motor with a 24-slot stator and a 30-slot rotor.



得獎學員與指導教授合照

This experience has been a significant steppingstone for me, as it has not only allowed me to improve my technical skills and knowledge but has also helped me develop greater self-efficacy and maturity. I am confident that these newfound abilities will serve me well in future endeavors, particularly as I embark on my career in Vietnam.

NGUYEN PHAM MINH TAN:

Through the TEEP program, I designed the motor with Taiwanese students to participate in the Motor design contest organized by RECHI Company and Advanced Power and Energy Center, NIU. Also, I had opportunities to visit modern production lines applied automation in Taigene Electric Machinery

Co., Ltd, TECO Electric & Machinery Co., Ltd, and RECHI Precision Co., Ltd. I participated the High-efficiency Rotary Compressor Motor Design Contest which was organized by RECHI and APEC. My team was assigned a 20-slot stator and 26-slot rotor motor design project. Initially, because of the language barrier, my team had quite a bit of difficulty in communicating, but then we were able to communicate better to complete the job excellently. Based on the current product reviews, my team had designed a better version of the benchmark which had lower cost and unchanged performance.

外籍學生與修課學生在台全電機參訪

TRAN QUOC THINH:

參與學生與實驗室學生出遊

Thanks to this TEEP 2023 internship program with the purpose of knowledge development and cooperation in a multinational working environment, I have gained a wide range of practical and useful skills which plays an important role in my future career development. Moreover, it was arranged to meet many leading motor manufacturing companies not only in Taiwan but also all over the world. This activity not only helps me to discover the motor industry but also enhance our soft skills such as English communication for both sides (Taiwan – Vietnam), negotiation, teamwork and presentation to convey messages effectively, which I may lack for such a long time

Finally, I would like to give special thanks to Professor Chen. He guided us and took care of us from the first day we came here. Besides, I would like to thank my Taiwanese friends who are extremely friendly and kind. Without you, I would be so lonely here.