Manual Pipe Beveling Machine: An Innovative Technology Research in Preparing Weld Materials

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Abstract: This innovative technology research addresses the need of the trainees to improve and develop their common competencies, specifically how to prepare weld materials as a prerequisite to the core competency. Further, it also responded to the issues and concerns of the Regional Training Center - Cebu in relation to the cross-cutting measures implemented to reduce the power consumption generated during the training. The descriptive survey method of research and document review were used in this research. To gather the needed data from the respondents/Trainees, a survey questionnaire was formulated. In addition, the data were analyzed and interpreted using percentage, weighted mean, and frequency; chi-square was utilized to determine whether a difference was significant. The data revealed that out of 50 SMAW Trainees for the two batches, the majority ranged from 22-27 years of age or 45 percent of the overall respondents and considered millennial trainees. It was then followed by another set of age ranged from 28- 33 years of age or 25 percent of the respondents which also considered belong to millennial generation and followed by another set of age ranged from 34-39 or 15 % of the respondents which are belong also to generation x learners. Further, 1 or 5 percent of the remaining respondents fell on the age ranged from 40-45 years of age, which is considered as the Generation X Trainees. This implies that the majority of the respondents belong to the millennial generation. The data showed a substantial correlation between the group respondents' SMAW abilities and their profile. The P value exceeded the significance threshold. This suggests that the respondents' profiles directly influence the competences of the group respondents. It was determined that there needed to be more common and core competency knowledge among the group responders. Thus, there is still a need to improve their skills and knowledge in the Shielded Metal Arc Welding qualification. Further, the issues and concerns regarding the cross-cutting measure were also responded to because it revealed a significant decrease in the total power bill consumption over the two consecutive years of

monthly monitoring. Therefore, it is highly recommended to fabricate another unit of this Manual Pipe Beveling Machine to maintain the savings and help reduce the power consumption generated by the SMAW qualification.

Keywords: shielded metal arc welding, competency-based training, training regulation, prepare weld materials, manual pipe beveling machine

INTRODUCTION

The advent of manual pipe beveling machines has ushered in a new era of innovation and efficiency in the field of weld material preparation (Houldcroft, 1990). These machines, equipped with cutting-edge technology and precision tools, offer manufacturers, fabricators, and welders a reliable means of achieving accurate and consistent bevels, tailored to the specifications and requirements of diverse welding projects. According to Hair et al. (2015), "millennial generations are productive individual if they are empowered and provided with training and development, then they might excel in their profession and become productive individual". This statement implies that an individual can only be a skilled and competent if they have experienced a series of training and development.

The competency development of the learner as a result of the training is the main focus of the competency-based training delivery method used by the Regional Training Center (NTTA, Plan Training Session, 2012; & Assessment of the Competency-Based Training (CBT). The training approach enables the learners to experience various activities inside the workshop to practice and develop a specific level of competency. Their practice will serve as a learning engagement in a particular task or job for them to master the competency. This learning engagement will help the trainees enhance and experience the actual face of the job, thus developing a certain competency.

One of the most important phases in the learning stage of the trainees, particularly in the Welding qualification, lies in how they engage in activities in order to develop their competencies, specifically in the common competency, which is Prepare Weld Materials (www.tesda.gov.ph, Training Regulation, Common Competency, 2005; & Villanueva, 2018). This common competency is necessary to be developed since this is essential prior to perform the core competencies. Their performance in the common competencies is a pre-requisite when they proceed to the core competencies, which require demonstration on how to prepare weld materials by beveling the pipe before they can perform the different welding processes. In the realm of welding and metal fabrication, the quality and integrity of welded joints are paramount to the structural stability, performance, and safety of various components and structures. At the heart of preparing weld materials lies the critical process of pipe beveling—a method aimed at shaping and refining the edges of pipes and tubes

to facilitate seamless welding and ensure the strength and durability of the joints.

It is in this technology research that the researcher envision to innovate and develop this manual pipe beveling machine without requiring electricity to operate in order to help the Training Institution reduce energy consumption and most of all, acquire such alternative equipment with a less monetary requirements to help the training institution economize and save the budget for the equipment.

Furthermore, it is also the desire and passion of the researcher to help the Trainees enhanced and develop their competency and performance on how to prepare weld materials through the use of this Manual Pipe Beveling Machine.

RESEARCH METHODOLOGY

In this study, the research methodology employed a combination of the descriptive survey method and document review. A meticulously crafted survey questionnaire was administered to participants to elicit crucial data regarding their experiences and perspectives. Subsequently, a comprehensive analysis ensued, utilizing statistical measures such as percentages, weighted means, and frequencies to meticulously interpret the collected data. Moreover, the significance of differences was examined using the chi-square test.

To augment the investigation, Appendix F1 & F2 cataloged the monthly power consumption bills, serving as a foundational resource for comparing the efficacy of cross-cutting measures implemented within the training institution.

Data Gathering Procedure

The survey was conducted to gather data of the respondents (SMAW Trainees). Survey questionnaire is attached as ANNEX A & ANNEX B.

Presentation of Data and Analysis:

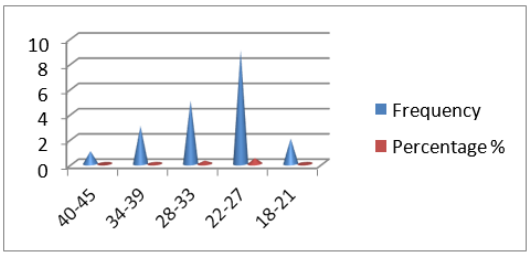


Figure 1 represents the age of the respondents (SMAW Trainees) . The data reveals that majority of the respondents belong to 22-27 ranged of age which are consider millennial learners which are motivated and empowered thru training and development to become productive individual.

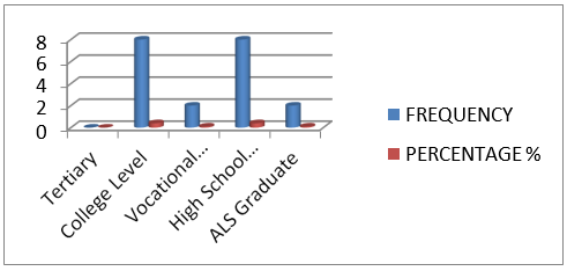


Figure 2 represents the highest educational attainment of the group respondents. The data revealed that majority of the group respondents were high school graduate as their highest educational attainment. This implies that they are lack of knowledge about the SMAW competencies.

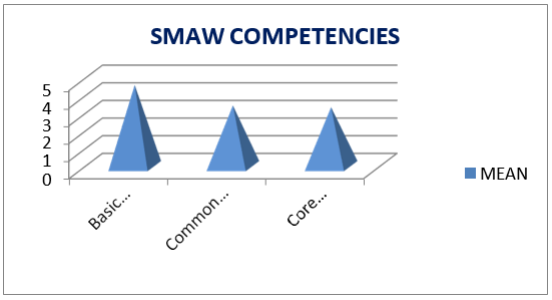


Figure 3 represents the level of SMAW competencies of the group respondents. The data revealed that the common and core competencies for the group respondents have a lower weighted mean which indicates less knowledgeable and need more training and development.

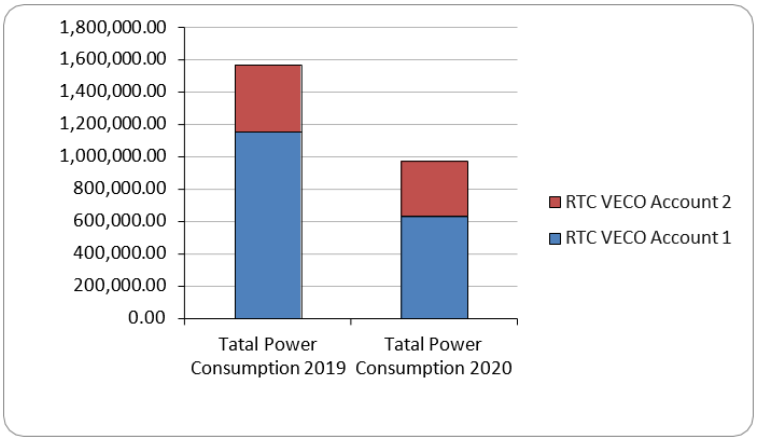


Figure 4. Comparison of the total power consumption for the two c.y. 2019 & 2020

Based on the above presentation it reveals that there is a significant decrease of the power consumption between the two consecutive years 2019 & 2020 respectively. In the first account the percentage of decrease is 54.70% and the second account the percentage of decrease is 81.90%. This implies that there is a big impact on the use of the Manual Pipe Beveling Machine for the SMAW qualification.

Project Design

The component parts of the project are the following:

1. Manual Transmission - a mechanical device use to drive manually the universal chuck

2. Universal Chuck - a mechanical device use to hold the pipe for beveling.

3. Liquified Petrolium Gas- a chemical substance use as a heating element in beveling the pipe.

4. Oxygen Gas - a chemical substance use as a cutting element in beveling the pipe.

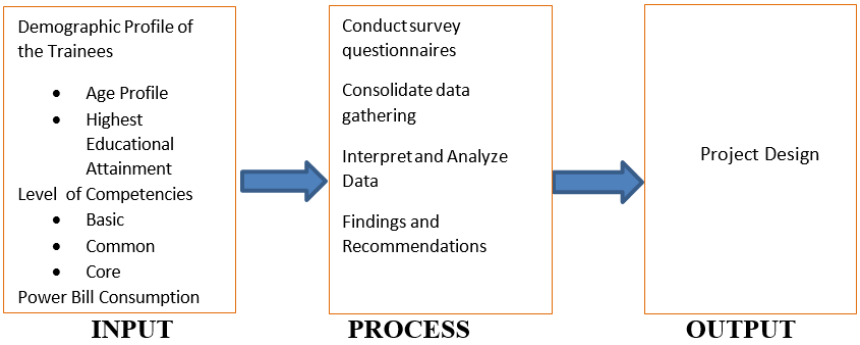
5. Bench Table - a fabricated table used as installation based for Manual Transmission and Universal Chuck.

The project is made of angle bar 2"x ¼ thick (mild steel bar) which serve as the installation based for the Manual Transmission which drives the Universal Chuck manually to rotate thus making the pipe turn clockwise while oxy-acetylene cut the pipe 45 degrees angle to form a bevel.

Below is the isometric view showing the construction details and dimensions of the project design. The Oxy-Acetylene outfit will serve as the alternative cutting device to bevel the pipe in order to prepare weld materials.

1. Project Development

This project was made and developed after a series of study. Below is the flow of the study for a design intervention through (input-process-output).



The tools and equipment, supplies and materials, cost of production and the timeframe in developing the project is presented in Annex 10.

Below are the pictures taken during the fabrication of the project.

2. Operation and Testing Procedure (Picture of Trainees operating the machine)

After the fabrication, the project was operated and tested to produce sample and gather some data to validate if the output met the required standard/parameter set.

Note: There must be proper recording and documentation.

2.1 - Demonstration of Trainer before sampling




3.2- Return Demonstration of trainees during the sampling


3.3 - The final product after the sampling (the beveled pipe ready for welding


3. Evaluation Procedure (Evaluation of output of the Trainees)

A. Parameters/Variables used in evaluating the project

Parameters/Variables	Evaluation Criteria	
	Lathe Machine	Manual Pipe Beveling Machine
1.Correctness of angle	30 degrees L	30 degrees L
2.Smoothness of the finished product	No scratch in the surface of the finished product	less scratch is present in the finished product
3.Accuracy	30 degrees L 100% accurate	30 degrees L 100% accurate
4.Time	20 minutes/piece	5 minutes/piece

5.Economy	100 pesos/piece labor cost	No labor cost
6.Cost of power	Php 57.00 / hour	No power cost
7. Total cost incurred	Php 66.00	Php 47.25

1. Comparison between sample output produce by the lathe machine and the manual beveling machine.

Output produce by Lathe Machine	Output produce by Manual Pipe Beveling Machine
	

2. Calculation on the total expenses incurred in the fabrication of the project.

Fabrication thru Lathe Machine

Operation	Power cost @ P 56.00/hr	No. of minutes	Amount	no. of sides
Cutting (power hacksaw)	P 0.95/min	30 min.	P 28.50	2
Beveling w/set up	P 0.95/min	30 min.	P 28.50	

Total 1 hr P 57.00 2

P57.00/2 = P 28.50 per side

Consumables	Price	no. of sides
1/2" Carbide Toolbit	P 300.00	8

P300.00/8 = P 37.50 per side

Fabrication thru Manual Beveling Machine

Operation	Power cost @ P 56.00/hr	No. of minutes	Amount	no. of sides
Cutting (power hacksaw)	P 0.95/min	30 min.	P 28.50	2
Beveling w/set up	0	5 min	0.00	1

P28.50/2 = P 14.25 per side

Consumables	Price per Cylinder	no. of sides
LPG Gas	1200.00	50
Oxygen	P 450.00	

Total P 1650.00 50

P1650.00/50 = P 33.00 per side

Total amount per side				
Operation	Time	Operation Cost	Consumables Cost	Total Cost
Machining	30 mins	P 28.50	P 37.50	P 66.00
Manual Beveling Machine	35 mins	P 14.25	P 33.00	P 47.25

RESULTS AND DISCUSSION

4. Project Description

This technology research, Manual Pipe Beveling Machine operates manually by turning clockwise the transmission handle. The transmission drives the universal

chuck to rotate the pipe being installed. The beveling of the pipe outfit is being installed vertically aligned at the Universal Chuck while the tip of the torch is set 30 degrees angle to perform cutting and beveling the pipe through melting the edge of the pipe of a high temperature using the LPG and Oxygen Gas flame to produce heating.

5. Project Structure

The project is made of angle bar 2"x ¼" thick mild carbon steel. It is design in a table work bench which will serve as platform for the Manual Transmission Machine and the Universal chuck. The Oxygen and LPG outfit serves as the cutting device to perform 30 degrees bevel angle between the pipe materials. This machine will be operated manually to save energy consumption or electricity.

6. Project Capabilities and Limitations

The project is capable to bevel at a minimum of 50 sides in 1 hour without using electricity. The limitations lies that the smoothness of the finished product is not the same as the one beveled using the Lathe Machine and also the availability of the transmission device in the local market.

7. Project Evaluation

Based on the evaluation of the project vis-à-vis with the product the result has so many advantages and there are also few disadvantages.

- Advantages of the project:

- It provide the trainees opportunity to practice and experience the actual face of the job.
- It helps develop the common competency particularly preparing weld materials
- It helps strengthen the performance of the trainees by constant practice.
- It will help develop safety practices of the trainees by constantly performing the task.
- No labor cost incurred
- Less cost of material and operation cost
- Less time in the production

- Disadvantages of the project:

- Smoothness of the finished product

CONCLUSIONS

Based on the findings mentioned above, the study found that the group respondents needed more knowledge about common and core competencies. Thus, there is still a need to improve their skills and knowledge in terms of common competency in shielded metal arc welding. Although most of them are qualified to become a pipe welder, the data still suggests that they need to practice more and improve their skills and knowledge, especially in common and core competencies.

Further, the issues and concerns regarding the cross-cutting measure were also addressed because they revealed a significant decrease in the total power bill consumption over the two consecutive years of monthly monitoring. Therefore, it is highly recommended to use this manual pipe-beveling machine in the fabrication to maintain the savings and help reduce the power consumption generated by the SMAW qualification.

RECOMMENDATIONS

It is recommended therefore, that the trainees should be given ample time to practice in the common and core competency and enable them to engage a varied activities that includes the practice on how to prepare weld materials using the manual pipe beveling machine. Further, it is also recommended that the manual pipe beveling machine should be available at all times when it is needed. It is suggested further to fabricate additional beveling machine to cater the needs of the trainees during the training and to further maintain the savings of the power consumption generated by the SMAW qualification.

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