Technical article 1

Towards a Regional Common Welding Certification Scheme (CWCS): Needs, analytics and common welding practices among the fabricators in Malaysia


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Institute of Material, Malaysia (IMM) is a non-profit professional society that promotes honourable practice, professional ethics and encourages education in materials science, technology and engineering. IMM is the Authorized Certification Body (ACB) for Malaysia for the Asian Welder Federation Common Welder Certification Scheme for fusion welding (AWF-CWCS). The ACB will qualify and certify welders in accordance to ISO-9606-1 standard. Such welders will be certified as AWS Certified Welders and must be registered in the Manpower Optimization System (MOS) in order to maintain their certification.

As part of IMM's vision and long term mission to educate, train and serve the materials fraternity, IMM Welding Committee task force conducted a feasibility study on the relevance and importance of having a Common Welder Certification Scheme in Malaysia. The study was conducted by Shon Laird from Oilfield technical Inspection and assisted by Leo Paul from IMM. The survey was executed by sending 16 questionnaires to various industrial partners who were willing to participate. However, only 11 returned the questionnaire, hence the sample size for the survey below is only 11. The results obtained from the survey are presented below.

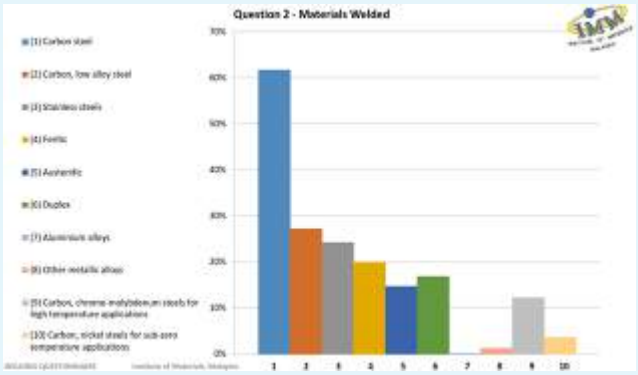

Figure 1: Responds to the types of materials most commonly used in the participating company

Figure 1 shows the type of materials most commonly used by the participating companies in the conducted survey. The results clearly indicate that carbon steels and low allow Carbon steels are the most popular material used for a wide range of products. It can also be seen that a significant amount of stainless steel such as Austenitic and Duplex is also widely used. Surprisingly the least used material among the respondents is Aluminium. Figure 2 depicts the types of cutting process most commonly used in the participating company namely the Oxy-gas flame cutting and Plasma cutting methods. Laser cutting methods and other methods such as shearing or water jet cutting were consumed less than 10%. This could be to the fact of the high amount of cost involved in the capex as well opex expenditures involving high end cutting methods such as laser cutting.

The most frequently used welding process is shown in Figure 3. Due to flexibility and mobility, the SMAW process is seen to be a favourable choice in the industry. However, other common welding processes such as GTAW, FCAW and SAW are also note to be reasonably popular choice, due its large usage on thick materials. Surprisingly GMAW is not seemed to much utilised.

Data pertaining to the material form utilised is shown in Figure 4. It can be clearly seen that most of the industries relies on wide material forms such as plates, I-sections, as well pressure and structural pipes.

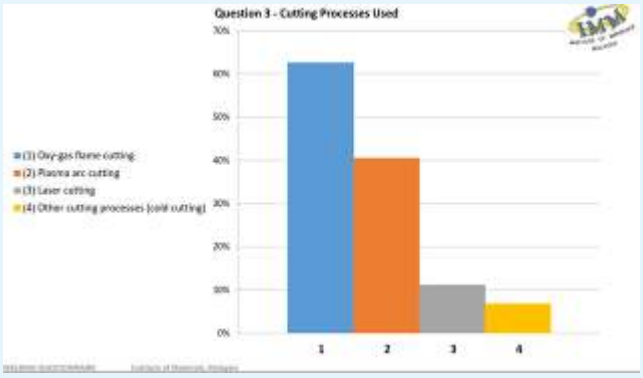

Figure 2: Responds to the types of cutting process most commonly used in the participating company

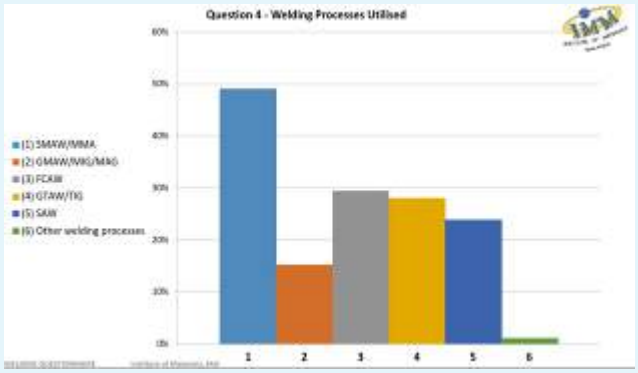

Figure 3: Answers to the types of welding process most commonly utilised among the respondents

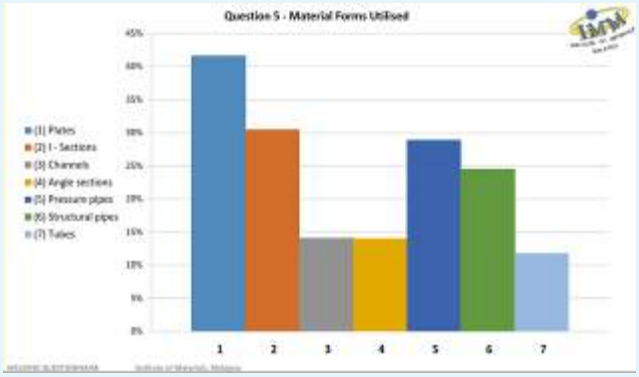

Figure 4: Answers to the types of welding process most commonly utilised among the respondents

However, channels, tubes and angle sections also see a reasonable amount of use, which are normally utilized to complement the formerly mentioned material forms.

Figure 5 noticeably indicates that most of the materials used by the respondents are 16mm and above in thickness. This justifies the higher percentage of welding process such as SAW and FCAW being used. Although lesser usage is seen in plate of 16mm thickness and below, the percentage of utilization is considered reasonably significant.

Butt joints and T joints were found to be the most regularly used Types of joint welded in the responding companies as shown in Figure 6.

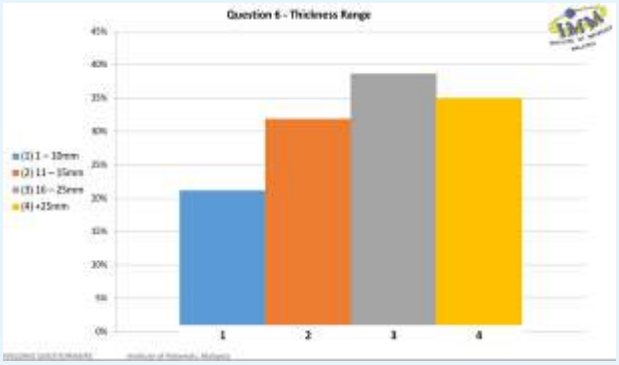

Figure 5: Replies to the Thickness range most commonly encountered among the respondents

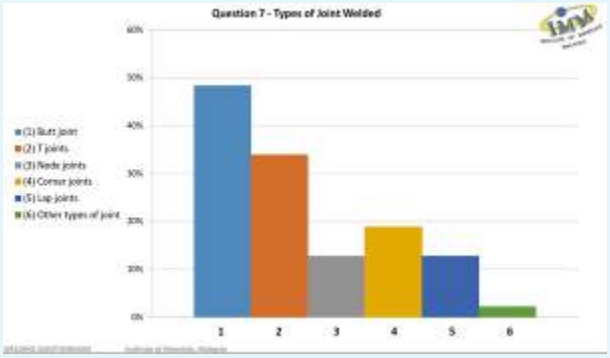

Figure 6: Replies to the most commonly used types of joint welded among the respondents

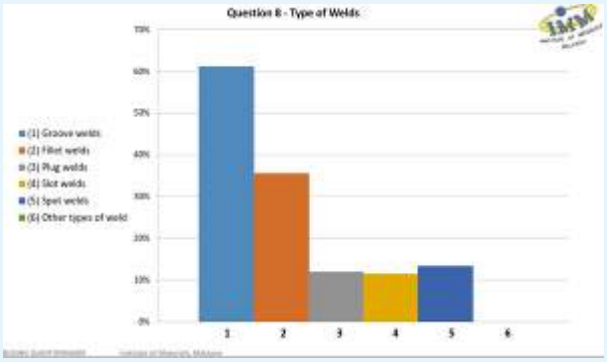

Figure 7: Reactions to the types of material form most commonly utilised among the respondents

This augurs well with findings in the welding process most commonly used such as SMAW, FCAW and SAW. Joints such as corner, lap and nodes only recorded a usage of less than 20% from the total usage of the participating companies.

Groove welds and Fillets welds as a popular choice among the companies that responded to the questionnaire is depicted in Figure 7. The finding of this question concludes the findings displayed in Figure 6, whereby Butt and T joints are calculated to be the most utilised choice. Groove welds are very much common in Butt joints while fillets would naturally fit in for T-Joints.

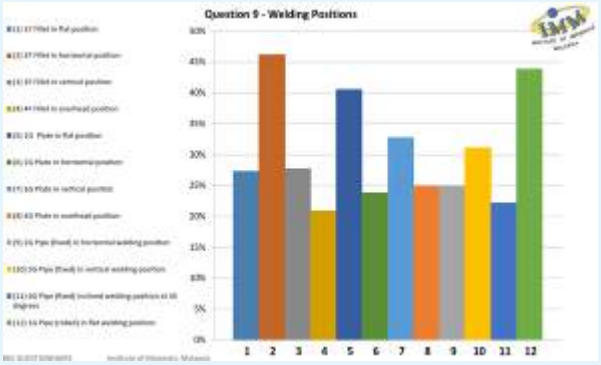

Figure 8: Answers to the types of welding positions most commonly encountered among the respondents

It can be seen that positions such as 2F, 4F, 3G, 5G and 1G seems to be positions that are encountered the most. These results are consistent with the findings displayed in Figure 4, which shows the most commonly used material forms.

Since plate, sections and pipes were found to be the mostly used forms of material, these welding positions are naturally the most in need in the participating industries.

Government initiated TVET institutions that offer welding certification schemes in accordance to the NOSS as per defined in the JPK SKM level 3 locally are plenty. This, in addition to the private TVET institutions that offer other international welder certification produces a significant number of welders in the market every year. Hence, it is no surprise that the industries are more willing to consider these trained and certified welder personnel for possible employment. Figure 9 clearly specifies that recommendation, testimonials and records from previous employers only contribute a very small percentage on the probability of being employed as a welder. Although welders from the welding training institutions area trained and certified to an national or international standard, very often the welders are asked to undergo a third party welder qualification test (WQT) prior to being employed. This clearly justifies the need of a well-established and internationally recognised common welder certification scheme.

In addition to the welders employed, Figure 10 clearly shows that welding inspectors and Non Destructive Testing (NDT) personnel are similarly important to have in an organisation involved in the welding industry. Apart from these 2 categories welding supervisors are also high in numbers needed. Welding supervisors usually does not possess any professional certification and are often senior welders who are upgraded or fresh graduates with a welding technology diploma. As it is a common practice to fabricate accordingly to the available drawing specifications and Welding Procedure Specifications (WPS), Welding Engineers are less used as companies involved in engineering, design details and WPS developments is small in numbers.

Figure 11 depicts how the organization monitors the competency and performance consistency of the welder in production welding. It can be seen that most companies conducts the common NDT methods for inspection namely the Magnetic particle inspection (MPI) Ultrasonic Testing (UT) and Radiographic/X-ray Testing (RT) as well as visual. This augurs well with the results obtained in Figure 10. It also noted that UT is used more frequently than RT. One interesting point to note is that almost 90% of the organisations surveyed keep the records of welder competency in production welding. Hence, welder monitoring and their repair rate as well as consistency of performance are key elements that are needed by the employers for several significant reasons. Among the notable ones are for re-certification purposes and quality assurance as well as addressing skill gaps.

Figure 12 shows that AWSD1.1 is the most popular and frequently used codes and ASME codes for pressure vessels as well as PD 5500 AWS1.6 are the next most often used codes. In addition to all these interesting data gathered from the survey conducted, the participants also highlighted several comments and needs of the industry specifically in relation to the current welders produced locally. Among the most notable ones were, Welders must be familiar with the WPS document and able to read and interpret it before they enter the job market. Welder training institutes should teach trainees the importance of following strictly to the instructions in the WPS in production welding. It was also noted that Welder training schools and institutes have to upgrade the practical workshop and classroom training curriculum. Welders are to be taught the passing/failing criteria of codes and standards – welding defects and how to avoid making these defects during welder training in practical welding skills training institutes rather than the currently practiced marking scheme that is not consistent with the industrial standards.

It was further highlighted in the survey that after the training, the welder testing must be conducted according to the procedures specified in the product or application codes and standards like ASME Sec ix, xii, PD/EN 13445, AWS D1.1 etc. Such testing and qualification is needed in the welding

fabrication industry. However, the most important and notable comments from the survey was the urgent need for skilled and competent welders and a database of such welders, their skills and experience to facilitate the execution of projects and reduce the amount of repeated WQT's conducted to qualify the welders for each project executed. They further elaborated and requested that IMM as well as PETRONAS to play a bigger role in setting requirements, for example: PTS as well as governing and regulating welding career as this also will create a barrier to entry for outsiders and push local standards higher up.

Several organisations also mentioned that it would be helpful if the database can also state the current welder performance in order to ensure that fabricators can get quality welders from the database. Moreover, it will be better if all oil and gas project in Malaysia use the same system to monitor welder performance as well as welder repair rate during the execution of the projects. In spite of the huge number of local TVET institutions producing certified and skilled welders, ironically, the industry still claims that getting a good and qualified local welder is difficult.

They claim that the existing welders do not suit the industrial needs and most of the existing welders in the market can barely pass the WQT. It is noted that currently there are 2 types of welder in the market, namely a Welder who train and learn welding by themselves. This type of welder is faced with problems in understanding the WPS even though some of them possess good welding skills. The second type is the welders with TVET institutions background and finishes their course with SKM level 3. This type of welders very often is found to barely pass the WQT because of the lack of welding skills. There is also a notable lack of auto/semi auto welder in the market.

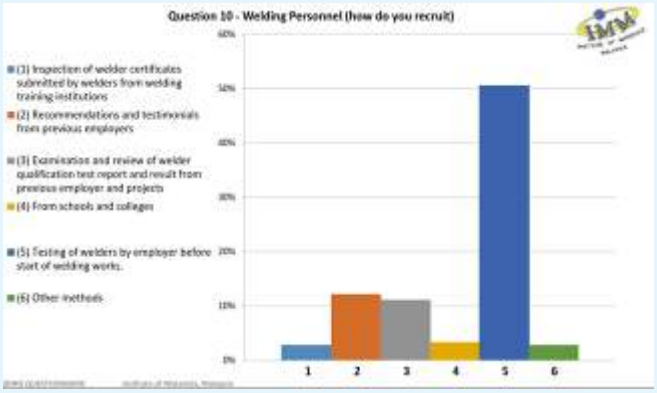

Figure 9: Responds to the types of cutting process most commonly used in the participating company

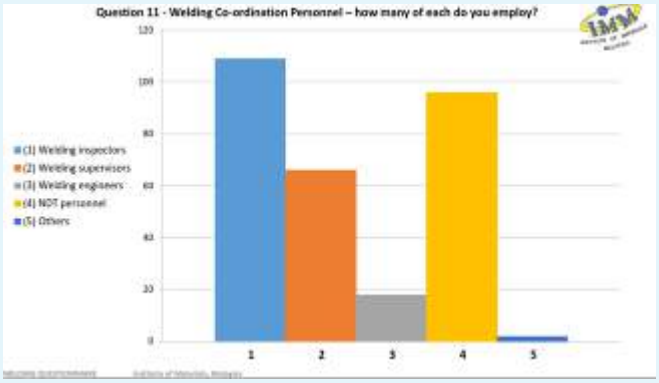

Figure 10: Replies to the types of most commonly employed type and number of welding co-ordination personnel in the participating

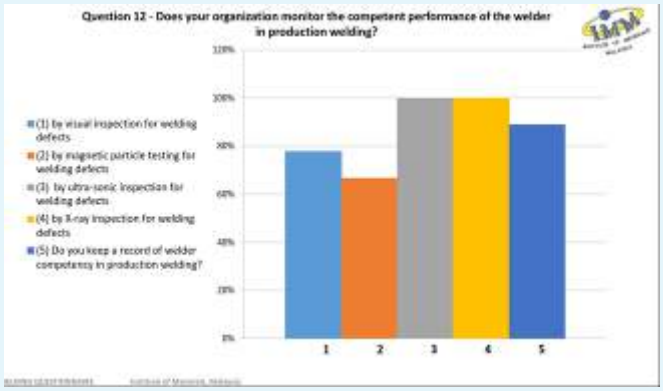

Figure 11: Replies to the welder monitoring efforts by the participating company

Most of the industrial players have changed their methods towards using auto/semi auto process to improve their schedule. Time concern is a major factor of the fabricators to make profit in their business. Unfortunately, most of the existing welders in the nation are in manual process. Another major concern highlighted by most of the organizations is that the salary of the welder's is not standardized throughout Malaysia. Welders are paid differently in different organisations hence this causes job hopping among the welders which disrupts the market human capital eco system.

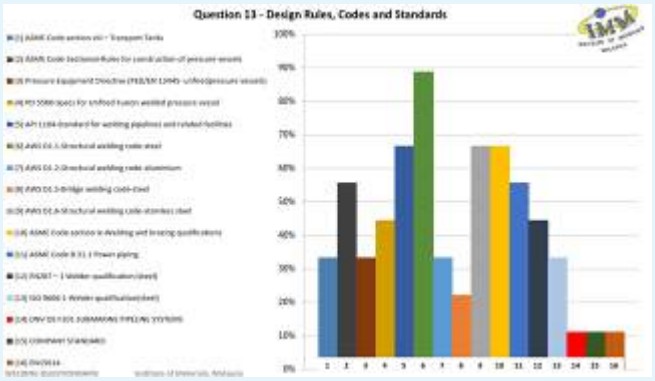

Figure 12: Design rules, codes and standards used by the participating company

It was highlighted that the current TVET institution's that produce welders does not teach the right syllabus, or the trainers in these institutions are not qualified enough to impart the right amount of knowledge needed to the welders. With millions spent on the development of these institutions, which sprawls across 7 different ministries; it is high time that the government or appointed taskforces do some serious soul searching on the future of the TVET in welding education, to produce market driven and industry ready welders.

Many of the companies surveyed welcomed and highly encouraged the existence of a common body, and a common welding certification scheme with welder monitoring facilities such as the AWF CWCS. This will allow us to know the population of the welders in the nation, as well have good quality welders, centralised and common data, and hopefully this will also be able to control the pay rate of the welders so that the welders will not simply quit or jump to another company.

As noticed on the welders coming from welding training institutes, lack of exposure and familiarity on the materials to be welded, filler metals and electrode and the Welding Procedures Specification to be applied. In summary, the industry surveyed the importance of forming a committee/task force to link the educational institution and the industries. The committee members then shall drive the team to come out with well-structured programmes to improve the knowledge and skills of welding personnel (Welding Engineers, Welding Inspectors, Welders, etc). In addition, the committee members will be responsible to gather all important information related to welding issues (e.g. guideline of controlling hardness at the HAZ area for extremely high tensile material) and spread it out as a part of knowledge sharing. It is highly hoped that institutions like the IMM and PETRONAS to play a bigger role in setting requirements i.e.., PTS as well as governing and regulating the welding career. Currently there is no active welding society in Malaysia that safeguards the interest of the welding community in Malaysia.