

FLUX CORED ARC WELDING FABRICATION AND ENVIRONMENT

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ABSTRACT

This article taking as a reference the European Welding Federation (EWF), with the environmental management system (EMS) for welded product manufacturer. The case study may be used to identify the key components of welding fume and their percent composition for flux cored arc welding.

1. GENERAL PROBLEMS

The international standards, dealing with environmental management activity, aim at providing companies with correct references for the application of an effective system helping them to get to their targets in the specific field. In this framework ISO 14001 (Environmental management system – Specification with guidance for use) has been prepared.

This standard adopts the general principles an integrated management system and applies to companies willing to:

- ? implement, maintain and improve an environmental management system;
- ? demonstrate the fitness of their environmental policy to other private or public parties;
- ? seek certification of their environmental management system by a external party accredited organization.

Companies going to implement an environmental management system according to ISO 14001 must first clarify their position with regard to their surrounding environment by performing an Environmental Analysis (EA).

This analysis constitutes the basis of the organization's environmental policy, through which they identify those environmental aspects of their activity that bring on or can bring on critical or dangerous situations.

As a general rule, this EA is performed taking into account at least the following main factors:

- ? emission in air;
- ? releases to water;
- ? waste management;
- ? contamination of land;
- ? use of raw materials and natural resources;
- ? other local environmental and community issues [2].

2. ENVIRONMENTAL MANAGEMENT SYSTEM IN WELDING FABRICATION

Fabrication by welding is a complex process that cannot be limited to the welding phase alone. Other activities are normally performed, before and after welding, which can give rise to impacts on the surrounding environment. Fabrication by welding can be regarded as made of the following main phases:

- ? material management and preparation;
- ? welding;
- ? tests in workshop and laboratory;
- ? final treatments.

The effectiveness of an environmental management system implementation relies on the support that all the Company personnel grants to the activities bringing on impacts to the surrounding environment.

This is the reason why the EN ISO 14001 asks for the whole personnel to be made aware of on informed about the problems relevant to environment in the ambit of the carried out activities.

Among the competencies of the personnel directly involved in the environmental management system are not to be forgotten those relevant to the specific fabrication process applied by the company. Such a competence is the only one to warrant sensibility and real technical understanding with regard to:

- ? the completeness of the environmental analysis
- ? the fitness of the environmental practice possibly already applied
- ? the fitness of the environmental programme [2] (table1)

Table 1 [7, 8, 9]

Activity	Aspects	Impact
Welding	Emission of radiant energy (light, heat) Production of slag and residues of welding materials Emission of fumes containing metal oxides, metallic elements and gasses (NO _x , O ₃)	? Surrounding pollution ? Ground pollution by metals, and their compounds ? Atmospheric pollution by metals, vapours, gases and particulate substances

3. CASE STUDY

This table 1 [1] may be used to identify the key components of welding fume and their percent composition. The percentage of key components such as manganese, silicon, sodium, fluorine, potassium, magnesium, lithium, hexavalent chromium, total chromium, soluble barium and in some cases nickel are given for automatic and semi-automatic flux cored arc welding of mild and low alloy steels, stainless steels and for hardfacing.

Table 1. Fume Composition Related To Welding Process and Consumables – flux cored [1]

Process	Filler Metal	Shielding Gases	Components in Consumable	Range of Key Components in Welding Fume Fume Analysis, Wt. (%)										
				Fe	Mn	Si	Na	F	K	Mg	Li	Ni	CrVI	Cr (total)
Automatic Semi-automatic (flux cored)	Mild-low alloy steel (Self-Shielded)	–	Fe, Mn, Ba, Si, F, Ca	7.0-42.2	0.5-7.0	0.1-6.0	0.2-22.0	4.0-24.0	<.01-15.0	0.9-28.0	0.4-8.0	0.02-2.0	Ba(sol) 1.0-24.0	Ba(total) 4.0-42.0
	Mild-low alloy steel (Gas-Shielded)	CO ₂ 98Ar/2O ₂ 90Ar/10CO ₂ 75Ar/25CO ₂	Fe, Mn, Si, F, Na, K, Cr	28.0-62.0	5.0-18.0	1.0-5.0	0.3-13.0	0.6-17.0	0.1-9.0	<.01-4.0	0.1-1.0	-		Cr(total) 0.4-2.0
	Hardfacing	–	Fe, Mn, Si, F, Cr	4.0-37.0	1.0-38.0	<.01-2.0	<.01-6.0	1.0-18.0	0.2-6.0	0.6-25.0	-	-	CrVI 0.4-1.0	Cr(total) 0.5-11.0
	Stainless steel (Gas-Shielded)	CO ₂ 75Ar/25CO ₂	Fe, Mn, Si, F, K, Cr	12.0-19.0	5.0-8.0	5.0-8.0	5.0-12.0	3.0-6.0	1.0-3.0	<.01-4.0	-	1.0-3.0	CrVI 0.3-2.0	Cr(total) 0.8-13.0
	Stainless steel (Self-Shielded)	–	Fe, Mn, Si, F, K, Cr	13.0 Approx.	6.0 Approx.	4.0 Approx.	5.0 Approx.	21.0 Approx.	18.0 Approx.	<.01-3.0 Approx.	-	3.0 Approx.	CrVI 4.0 Approx.	Cr(total) 9.0 Approx.

4. CONCLUSION

4.1 The international standards, dealing with environmental management activity, aim at providing companies with correct references for the application of an effective system helping them to get to their targets in the specific field.

4.2 Companies going to implement an environmental management system according to ISO 14001 must first clarify their position with regard to their surrounding environment by performing an Environmental Analysis(EA).

4.3 Fabrication by welding can be regarded as made of the following main phases: material management and preparation; welding ; tests in workshop and laboratory ; final treatments.

4.4 The case study present the percentage of key components of welding feim for automatic and semi-automatic flux cored arc welding of mild and low alloy steels, stainless steels and for hart facing.

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