

# Substitution of Thoriated Tungsten Electrodes in Switzerland

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**Abstract** Thoriated tungsten electrodes are frequently used for inert gas welding (TIG/WIG). The use of these electrodes can lead to doses which are well above the limit for the general population (1mSv/year). This has been shown by different investigations, for example from the “Berufsgenossenschaft”. With these findings in mind, the regulatory authorities (Swiss Federal Office of Public Health (SFOPH) and Swiss National Accident Insurance Association (Suva)) started in 1999 to examine the justification of thoriated tungsten electrodes and a possible substitution with products containing no radioactive material. Up to this time, the use of thoriated tungsten electrodes could be justified since no thorium-free products leading to comparable results were available on the market. This was also the reason why the SFOPH approved several types of these electrodes. Discussions with formation centers for welding and inquiries made at welding shops, trading companies and producers showed that in the mean-time thorium-free products with comparable welding specifications and results became available on the market. Since the 1 January 2004, thoriated tungsten electrodes can only be used if the user has obtained the corresponding license from the SFOPH. The use of thoriated tungsten electrodes is thus not completely forbidden, but very strict conditions have to be fulfilled.

Up to now and due to the involvement of the relevant partners, the substitution process has not met any problem. Neither trading companies nor users made any opposition and no request for obtaining a license for thoriated tungsten electrodes was made.

## Introduction

I am very pleased to have the opportunity of presenting to you in this group, under the title “Substitution of thoriated tungsten electrodes in Switzerland”, a successful chapter of our work. First of all I would like to thank Georges Piller, the co-author of this presentation very much for his valuable support.

## Contents

This is what I will be talking about in the course of my 20 minute presentation:

- Brief Introduction
- Legal Basis
- Health Aspects, Doses
- Clarification / Preparation
- Information
- Current Situation
- Perspective

## 1. Brief Introduction

As well as other different consume products which contain thorium, for example gas mantles, electric contacts and wires for bulbs, the thoriated wolfram electrodes which are used for Tungsten Inertgas Welding, shortened to TIG, are very widespread throughout the world. In the 1940s this welding process became popular in Germany and since then it has established itself above all because of the following advantages.

- good ignition
- low electrode consumption
- high temperature operating
- high quality welding

Thoriated wolfram electrodes, in short WT, are typically made up of 1 to 4 percent thoriumoxyd ( $\text{ThO}_2$ ). The activity per electrode is between 0.8 to 4 kBq.

## 2. Legal Basis I

Before I continue with the WT I would briefly like to introduce you to the Swiss legislation on radiological protection. The legislation on radiological protection is made up of:

- Swiss Radiological Protection Act (StSG)
- Swiss Radiological Protection Ordinance (StSV)
- Various technical prescriptions

The following authorities and institutions have the task of enforcing the legislation:

- Responsible as licensing authority for the medical and technical application of ionizing radiation is the Swiss Federal Office of Public Health (SFOPH)

Responsible as regulatory agency for the industrial use of ionizing radiation is the:

- Swiss National Accident Insurance Fund (Suva)

Suva is the obligatory accident insurance in Switzerland. Suva insures over 1.8 million employees in 110'000 companies against occupational and non-occupational accidents as well as against work-related illnesses. Suva's services include prevention, insurance and rehabilitation.

## 3. Legal Basis II

Let's go back to WT. As in the radiological protection regulations of other countries, in our country too the free limits or, respectively, the authorisation threshold regarding specific nuclides, is fixed. The exemption limit for Th-nat is 6 Bq/kg and/or 6 Bq absolute. At this point I would like to point out that the definition of the expression "exception limit" cannot be equated with that in the EU guidelines. The authorisation threshold lies at 20 Bq. So an approval actually has to be applied for every time WT is used. The SFOPH can give approvals. These approvals (from the SFOPH) have the effect that the final user himself doesn't need an authorisation for the use of ionizing radiation.

#### **4. Legal Basis III**

In the past various types of this kind of electrode from SFOPH have been authorised in Switzerland. Authorisations are given considering the following criteria, namely:

- Justification and
- Optimisation

What is more, authorisations regularly have to be adjusted to the technical development. And finally: Approvals are limited to a maximum of 10 years.

#### **5. Health Aspects, Doses**

In the 1990s various examinations were carried out at workplaces at welding companies. These showed that when thoriated wolfram electrodes are used improperly, especially when sharpening the electrodes, radiation doses of almost 20 milli-Sievert (mSv) per year can be caused. This dose is 20 times higher than the legally allowed amount for non-professional people exposed to radiation. The results of this examination have induced the SFOPH and the Suva to push on with the substitution of WT.

#### **6. Clarification**

In 1998 the market position looked like this. There were only WT from two producers on the market. Slightly more than 10 companies were authorised to trade with and import and export WT. These traders mainly delivered WT to end customers but also to various middlemen.

From 1998 to 2000 the SFOPH and the Suva arranged various matters. To begin with we made sure that there were thoriated wolfram electrodes available on the market where results could be obtained which were comparable to results obtained with the WT which had been used up to now. Such electrodes, like, for example, those with added LanthanO<sub>2</sub> and CerO<sub>2</sub> had, at that time, been doing well on the market for years. Sales figures published by traders showed that the share of products without added thorium was much higher than the share with thorium. The share of products without thorium at this time amounted to clearly more than 70%.

As a result of this we contacted welding specialists and the Swiss Welding Association and checked whether WT need urgently be used for specific welding jobs. Finally, a WT producer and the Swiss Trade Association accepted our invitation to meet and discuss the matter. We got around the table and tried to convince everyone present of our aim, namely to achieve the substitution of WT by 31.12.2003.

#### **7. Information I**

After we had presented our substitution strategy in this group, the second step was to once again inform the producers of WT in Germany and Austria and all the traders registered in Switzerland. We announced that the SFOPH would limit the validity of all existing authorisations for WT to 31.12.2003. In a letter to the dealers we enclosed an information leaflet with explanations of the substitution policy. The traders were asked to give all WT buyers a copy of the information leaflet. As a supporting measure, articles about WT and occupational health and safety were placed in various professional journals. There was also information on the subject on the home pages of SFOPH, Suva and the Swiss Welding

Association. Naturally, the substitution is also an important subject at training centres for welders. Finally, the subject was also taken up in the framework of further education events in specialist circles with the participation of electrode producers.

## **8. Information II, compulsory licensing procedure**

In spring 2003 we sent out a registered mail to traders and all shops selling extra items for welding. In this letter we informed them of the following points:

- we pointed out once again that the validity of the authorisation would be limited to 31.12.2003
- traders who want to sell WT after this date must have a recognised qualification in radiation protection
- presentation of radiation protection instructions
- Duty of care = < delivery of WT only to license holders
- and finally they must have a suitable storage room for WT.

Everyone who received this letter also had to fill out a questionnaire answering various questions in connection with the sale of WT and send it back to the SFOPH.

The trading companies also received the letter that was prepared for the consumers of WT, for the welding companies. They received this letter for their own information and also so they could pass it on to the welding companies. In this letter the welding companies were informed about radiological protection requirements which would have to be met if they continued to use WT. As well as the already mentioned requirements, additional requirements for WT users are:

- Justification of the use of WT for the specific work by presentation of a formal questionnaire
- Set up of separate workplaces for WT welding
- Dosimetries => analysis of urine once a year
- Workplace monitoring => air filter and contamination

By the end of September, 100 % of the companies which had been written to had filled in and returned the questionnaire. We waited expectantly for 31.12.2003, respectively 01.01.2004, when everything would change. Would we get a lot of telephone calls and would we have piles of applications for authorisation on our desks?

## **9. Current situation**

Now, 21 months after the validity of the authorisation has expired, the situation is as follows:

- WT are no longer available on the market.
- The existing supplies of WT are being used up without an authorisation being necessary. We wanted a pragmatic solution.
- In the case of a company wanting to deposit its WT as radioactive waste because this cannot be given back to the producers, the SFOPH has created a corresponding deposit spot.
- Until now 10 inquiries from trade companies and welding companies have been received. We were able to answer all of these inquiries to the satisfaction of the person inquiring.
- Until now there have been neither requests to trade, nor to use WT.

## **10. Perspective**

As I stated at the beginning, products which contain thorium in one form or another are, of course, still available. We are also aware of the fact that not all products that contain thorium can be replaced from one day to the next.

By efficiently keeping a watch on the market, by constantly mentioning this topic in public and naturally by contact to the producers we want to sensitize the consumer in future too. It is in this way that we want to achieve that thoriated products are replaced more and more by sensible substitutes.