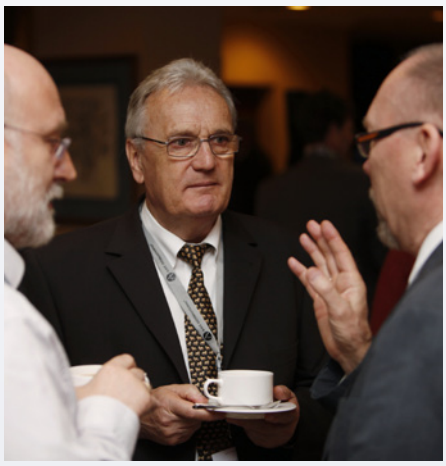
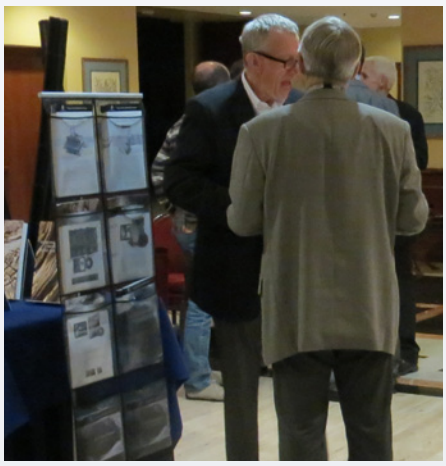
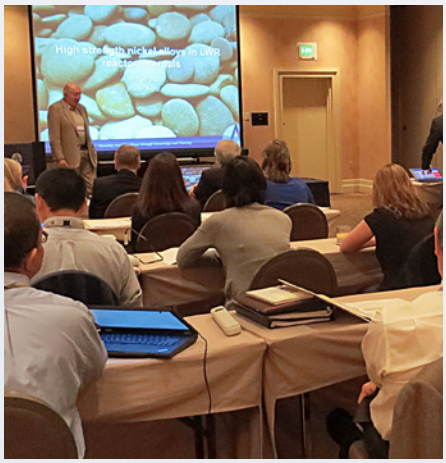
The Antenna
NEWSLETTER FROM ANT INTERNATIONAL No.23 2013

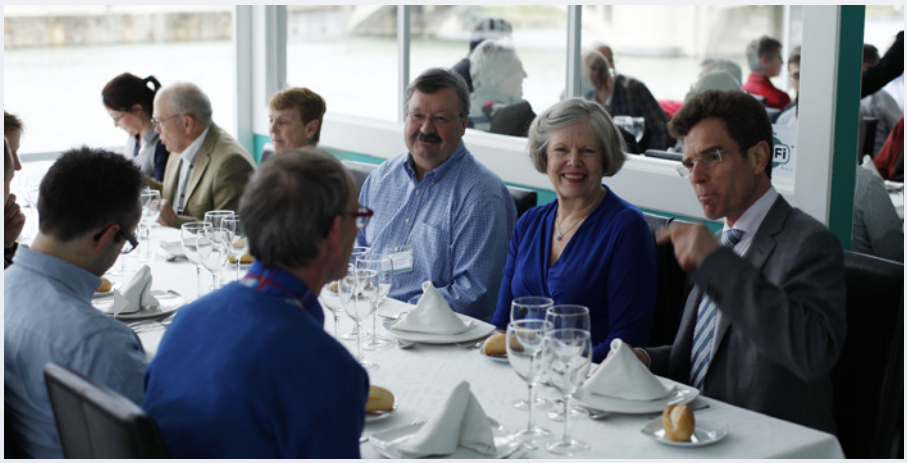
## FOLLOW UP – ZIRAT & LCC SEMINARS

CLEARWATER BEACH 2013
SEVILLA 2013
FEBRUARY–MARCH 2013







The annual ZIRAT* and LCC* Seminars were carried out in the US and Spain during February–March 2013.

In 2013 one ZIRAT Seminar was held in Clearwater Beach, Florida and one in Sevilla, Spain. A total of 49 participants representing 25 organisations took part in both Seminars.

In Sevilla, Spain a total of 29 participants representing 16 organisations took part in the European LCC7 Seminar.

*Read the ZIRAT17 evaluation*
*Read the LCC8 evaluation*
*See pictures*
*See film from the Seminars*

Feedback

Editor & publisher: Peter Rudling 

## Feedback from the ZIRAT Seminars:

*"Great conference!"*

LEIF MICHELSSON
Fuel Engineer, Nuclear Fuel, TVO

*"An interesting seminar with very useful information and a close overview of the state of art of nuclear fuel. I will recommend the seminar to my colleagues."*

IGNACIO COLLAZO
Reload Safety Analyst, Iberdrola


Listen to Frank Holzgreve,
Reactor Physics Division Manager at BKW

## Feedback from the LCC Seminar:

*"The LCC Seminar has been very enjoyable and informative. It has broadened my understanding of many topics and has given me ideas/research to explore in the near future."*

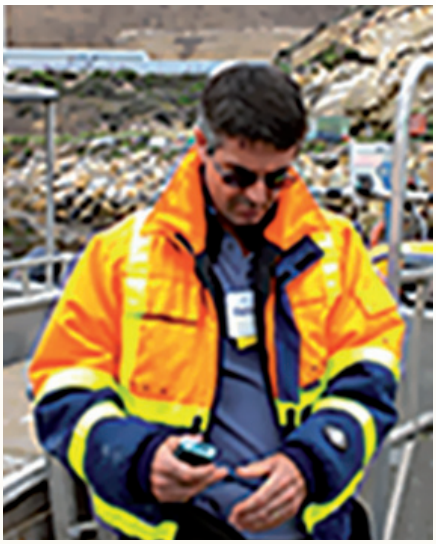
JOHN MCGRADY
Rolls-Royce sponsored EngD Student,
University of Manchester


Listen to Juan de Dios Sánchez Zapata,
C.N.Cofrentes Plant Life Management at Iberdrola

* The Annual Zirconium Alloy Technology (ZIRAT) Program is focused on fuel assembly material issues and open to nuclear utilities. The overall objective of the ZIRAT Program is to enable the nuclear utilities and laboratories to gain increased understanding of material behaviour related to successful core operation. Read more

The Annual LWR Chemistry and Component Integrity (LCC) Program is focused on reactor coolant and RCS material issues and open to nuclear utilities, fuel vendors, research laboratories and regulatory agencies. The overall objective of the LCC Program is to enable the LCC Member to gain increased understanding of reactor water chemistry related to a successful plant operation and continued integrity of Reactor Coolant System (RCS) materials while keeping radiation exposure low. Read more

# HANDBOOK AND TAILORED SEMINAR



Malcolm B. Smith P.E.
Safety Analysis/Reactor Engineering
Callaway Nuclear Plant

I ATTENDED THE training course for the Fuel Design Review Handbook during the Summer of 2012 at Diablo Canyon Nuclear Power Plant. As a Safety Analysis Engineer in the process of cross training into Core Design, this handbook is a must have.

It covers all of the critical aspects of nuclear fuel design and does an incredible job of comparing the different design variations used all over the globe. But the most useful part of the Fuel Design Review Handbook is all of the recommended parameters that are to be considered during fuel audits and in the core design process. They cover, in detail, what an audit should focus on, procedural guidance, audit structure and timing and all of the details in the various fuel design and fabrication process at the end of each section. Cladding, pellets, spacer grids, materials, etc are also covered and explained in detail. It is a very impressive and useful document.
As for the training, ANT International brought in the lead writers of the Fuel Design Review Handbook and gave a two day course which detailed out the various sections of the Handbook and allowed for input from all of the attendees.

The course participants came in from the Fuelco plants (Callaway, Comanche Peak, and Diablo Canyon) and provided enlightening insights to the process of core design, fuel fabrication inspection, fuel failures and other issues that they have encountered over the years. For me, it was a very useful class and I would recommend it for any utility engineers that are currently involved in core design or are considering it.

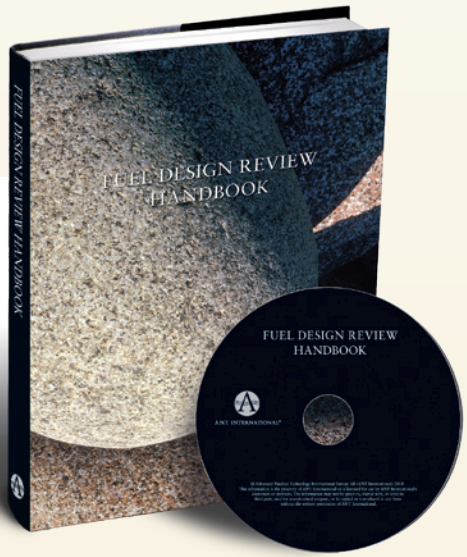
My thanks to all the folks at ANT International that set up this training and especially to Mr. Peter Rudling and Mr. Alfred Strasser for their input and course discussions. As a Core Designer in training, it was a useful course and a reference I will be using a lot.

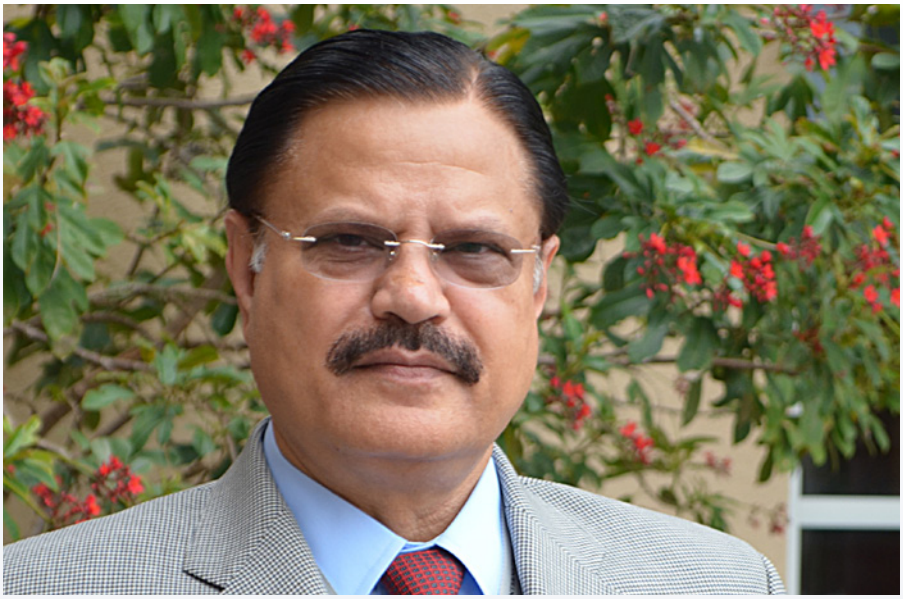
*Listen to Alfred Strasser* about why FDRH is important

*Sample report*

Fuel Design Review Handbook provides a guide for reviewing and auditing the fuel design to assist in the assurance that it will perform its design functions adequately. Read more

For further questions and inquiries on the FDRH, please contact Angela Olpretean; angela.olpretean@antinternational.com or phone; +46 (0)70-263 13 77.





# Sheikh Tahir Mahmood

*Your name, title, where you live*

Sheikh Tahir Mahmood (I prefer to be called Tahir), Nuclear Engineer/ Consultant, 4437-C Valley Ave. Pleasanton, CA 94566, USA.

*How did you get started as an engineer?*

I did Masters (M.Sc.) in Physics at the Punjab University, Pakistan and won a national scholarship to pursue Masters in Nuclear Technology at the Islamabad University, Pakistan, which I completed in 1976. After teaching nuclear engineering subjects for several years, I completed my Ph.D. degree in Nuclear Engineering at the North Carolina State University (NCSU), USA in 1989. My post-graduate work was on crystallographic texture and mechanical anisotropy of zirconium alloys.

*Your career history?*

After completing the Ph.D. degree, I worked as post-doctoral fellow at the Nuclear Engineering Department of NCSU. I worked mainly on experimental investigations of properties of zirconium alloys that resulted in a number of journal and conference proceeding publications. In 1991, I joined the Metals and Ceramics division of the Oak Ridge National Laboratory (ORNL) where I worked on radiation effects on reactor pressure vessel steels and aluminum alloys including faster than expected radiation embrittlement of the pressure vessel of the High Flux Isotope Reactor (HFIR) at ORNL. The large magnitude of high energy gamma flux, that was being experienced by the vessel, was found to be responsible for the excessive embrittlement. In 1994, General Electric Company hired me to work on root cause investigations of the degradation of the failed BWR fuel rods, hot cell investigations of the irradiated fuel bundle components, and development of mechanical property data base for the newly developed products. I was stationed at the GE Vallecitos Nuclear Center in California. One of my last projects at GE was root cause investigations of the excessive bow in Zircaloy-2 channels. Most of the results of these investigations have been published in open literature. At GE, I got a chance to actively participate in various international nuclear industry research programs such as NFIR at EPRI, USA; SCIP at Studsvik, Sweden; Dimensional stability program at RIAR, Russia, and JHIP at CEA, France. I retired from GE in September 2012. I have authored or co-authored over 40 papers in technical Journals and International Conference Proceedings. I am consulting for a few organizations in my areas of expertise.

*How did you get introduced to ANT International and the ZIRAT/IZNA Program?*

I was introduced to ANT International by my ex-manager and friend Ron Adamson who himself have been a very active member of the experts team.

*How has the field of nuclear fuel issues changed during your career?*

When I started to work in the field of BWR materials technology, degradation of the failed fuel rods, with Zr liner, was a major issue for the plant operators and the fuel vendors. This issue was resolved reasonably well by improving the corrosion resistance of the Zr liner through the addition of small quantities of alloying elements. Now many companies are working on SiC cladding for improved reliability and performance.

Increased cycle lengths and bundle burn ups resulted in the issue of Zircaloy-2 channel bow in BWRs. Hot cell investigations pointed to enhanced bow due to hydrogen differential between the channel sides next to and away from the neighboring control blade. This was the result of shadow corrosion related enhanced corrosion and hydrogen pick up on the channel side next to the blade. Fuel vendors offered Zircaloy-4 channels as the interim solution (due to its low hydrogen pick up properties) while they started working on the more permanent material solution like Zirlo and NSF alloys.

During most of my career in this field, $UO_2$ was the fuel of interest. However, work was being done on developing various types of additive fuels. Some vendors have already

introduced additive fuels on commercial basis while others are working on these. More recently a lot of emphasis is being placed on SMRs and reactors that use the already used fuel to extract more energy out of it and reduce the volume of the radioactive waste.

*What do you foresee the future of the nuclear industry and how does the ZIRAT/IZNA programs fit in?*

I think the nuclear industry will continue to grow in spite of the Fukushima accident, and nuclear energy will be a significant part of the energy mix in developed and developing countries. The ZIRAT program provides an excellent platform for technical interaction between plant operators and other experts to make continuing improvements to operate plants safely and cost effectively. In addition, ZIRAT program also provides basic training for young engineers in this field. The IZNA program provides the fuel vendors and regulators concise summary of the current state of the fuel technology in the form of specialized reports and seminars.

*How do you spend your leisure time?*

I am an avid fan of poetry in Urdu (a language widely spoken in the Indian subcontinent). Luckily, the UC Berkeley library has a huge collection of Urdu poetry books by classic poets from 18th to 20th centuries. I make good use of these books to prepare for being MC of the monthly Urdu poetry recital programs in the San Francisco bay area. In addition, I always look forward to travelling to visit new places and experience new cultures.

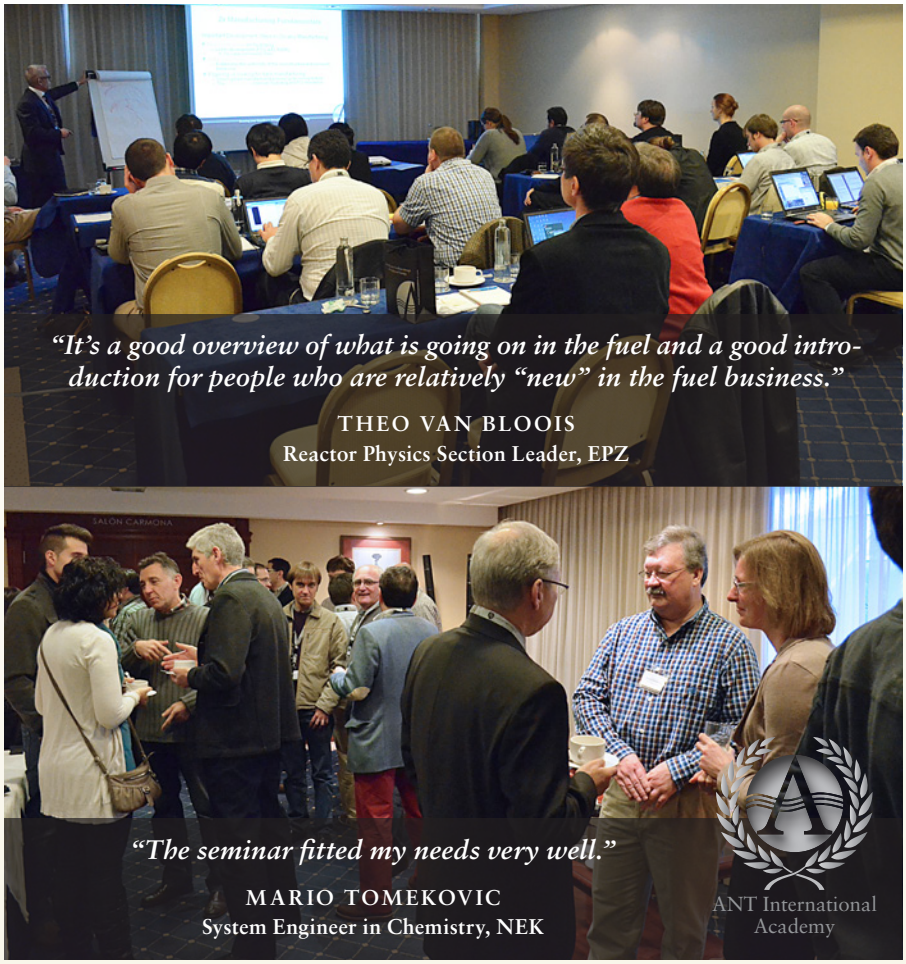
## FOLLOW UP – ANT INTERNATIONAL ACADEMY SEMINARS

For the first time, the ANTIA* Seminars were carried out the week before the ZIRAT/LCC Seminar in Seville, Spain in the same hotel. A total of 54 participants representing 12 organizations took part in the ANTIA Seminars.

Due to the great success of the Seminars, ANT International will offer these Seminars both in Spain and USA in 2014 at the same hotels and in conjunction with the ZIRAT/LCC seminars. We have also included a seminar on Fuel Design Review in USA and a seminar on Fuel Fabrication in Spain.

***Read the ANTIA evaluation***
***See pictures from Sevilla***
***Upcoming Seminars***

* ANT International Academy (ANTIA) is an educational programme for staff desiring both a bird's eye view and a comprehensive introduction and overview of the following topics: Fuel materials, BWR/PWR/VVER plant chemistry and structural material degradation. degradation. Read more





Listen to Machiel Bos
Senior Mechanical Engineer at EPZ


Listen to Magdalena Wilczynska,
System Engineer Project Manager at KKL


Listen to M.J. Schroevers,
Chemical Engineer at EPZ

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