



A.N.T. INTERNATIONAL®

Boosting your Excellence through Knowledge and Training



MARCH – APRIL 2020



A.N.T. INTERNATIONAL®

*Boosting your Excellence through
Knowledge and Training*

Invitation and Seminar Schedule of

Zirconium Alloy Technology (ZIRAT),
LWR Chemistry and Component Integrity (LCC)
and A.N.T. International Seminars (ANTIA)

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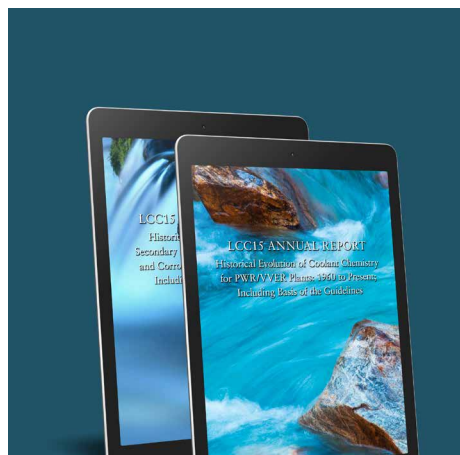
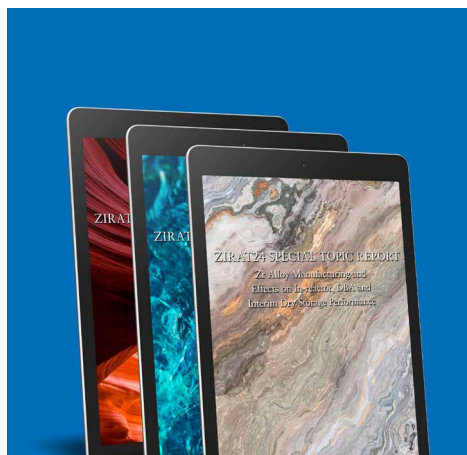


Welcome To Our Annual Seminars

We are pleased to announce the arrangements for the ZIRAT24, LCC15 and A.N.T. International Academy (ANTIA) Seminars that will take place in USA (ZIRAT24) and Sweden (LCC15, ANTIA and ZIRAT24). The ANTIA seminar in Stockholm is open to all organisations while ZIRAT and LCC are open only for ZIRAT and LCC members.

- In USA, the ZIRAT24 Seminar will be held on **17–18 March, 2020** at Sheraton Sand Key Resort, Florida, USA.
- In Europe, the seminars will take place in April, 2020 and will be hosted by Vattenfall, in Stockholm, Sweden:
 - » The LCC Seminar will be held on **15–17 April**.
 - » The ZIRAT24 Seminar will take place on **20–22 April**.
 - » The A.N.T. International Academy Seminar, will take place on **23–24 April**.

For more detailed information and prices of the ANTIA Seminars, [click here](#).





A.N.T. International Seminars 2020

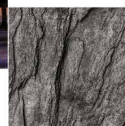
Clearwater Beach, Florida, USA.

TUESDAY 17 – WEDNESDAY 18 MARCH, 2020



ZIRAT24

[CLICK HERE TO SIGNUP](#)

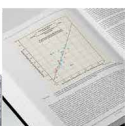
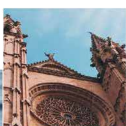
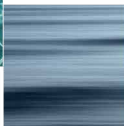


**17-18 MARCH 2020
TWO-DAY SEMINAR**

Presentations by: Dr. Kit Coleman,
Dr. Albert Machiels, Dr. Tahir Mahmood,
Prof. Gary Was, Dr. Daniel Parrat,
Prof. Arthur Motta, and Mr. Peter Rudling.

Stockholm, Sweden

WEDNESDAY 15 – FRIDAY 17 APRIL, 2020 (LCC)



**15-17 APRIL 2020
THREE-DAY SEMINAR**

Presentations by: Dr. Francis Nordmann,
Dr. Suat Odar, Dr. Samson Hettiarachchi
and Dr. Jiixin Chen.

LCC15



[CLICK HERE TO SIGNUP](#)

Stockholm, Sweden

MONDAY 20 – WEDNESDAY 22 APRIL, 2020 (ZIRAT)

THURSDAY 23 – FRIDAY 24 APRIL, 2020 (ANTIA)



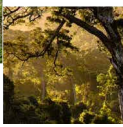
ZIRAT24

[CLICK HERE TO SIGNUP](#)



20 – 22 APRIL 2020 THREE-DAY SEMINAR

Presentations by: Dr. Kit Coleman, Dr. Charles Patterson, Dr. Albert Machiels, Dr. Sheikh Tahir Mahmood, Dr. Malcolm Griffiths, Dr. Clément Lemaignan, Dr. Audrius Jasiulevicius, Dr. Daniel Parrat, Dr. Shaohong Zhang and Mr. Peter Rudling.



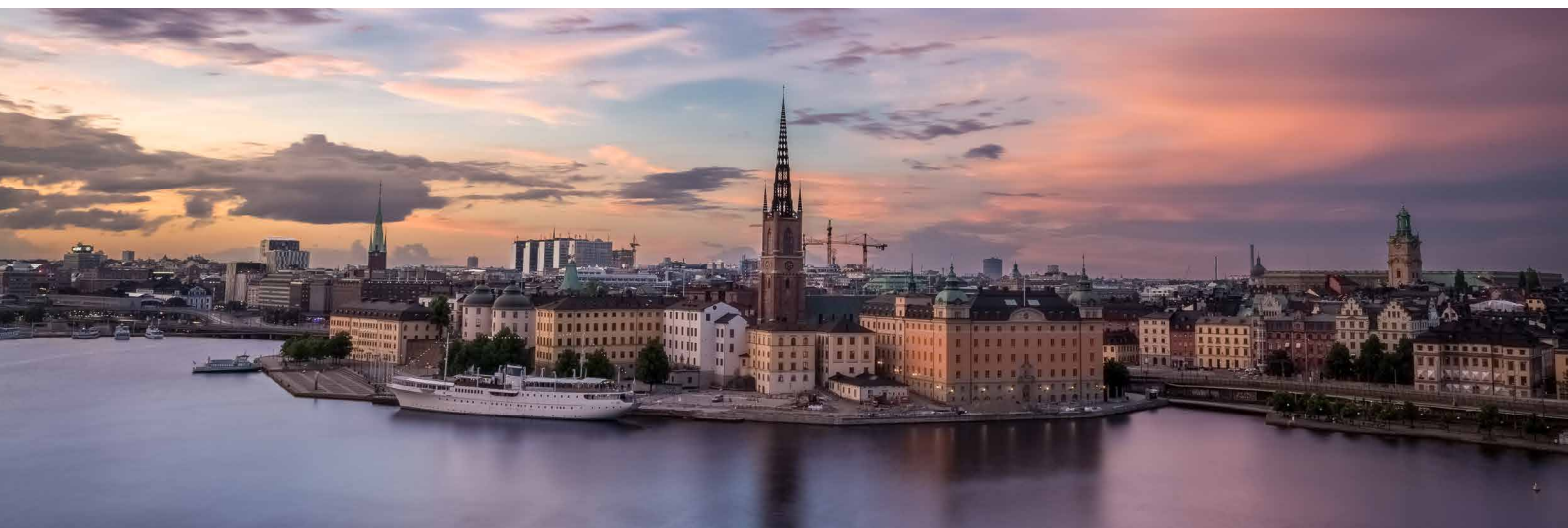
23-24 APRIL 2020 1.5-DAY SEMINAR

Presentations by: Dr. Gérard Ducros, Dr. Tahir Mahmood, Dr. Martin Steinbrück, Prof. Gary Was, Dr. Kit Coleman, Dr. Charles Patterson, Dr. Albert Machiels, and Mr. Peter Rudling.

Accident Tolerant Fuel



[CLICK HERE TO SIGNUP](#)



LCC15 Seminar Presentations

At the LCC15 Seminar the following Annual Reports will be presented by the authors:

- Historical evolution of coolant Chemistry for PWR and VVER plants: 1960 to present; Including Basis of the Guidelines
- Report on Historical and present issues on secondary system chemical treatment and corrosion in PWR/VVER units; including materials behaviour

Other technical presentations will be given at the LCC15 on:

- The impact of water chemistry transients on Nuclear Power Plant materials and plant performance
- Fuel Crud in LWR

Up to eight (8) persons employed by a LCC15 Member organisation can attend the LCC15 Seminars in Europe.

LCC15 Seminar Lecturers



The presentations at the LCC15 Seminar will be given by Dr. Francis Nordmann, Dr. Suat Odar, Dr. Samson Hetiarchchi and Dr. Jiabin Chen.

[*Read more about the Network of Experts*](#)

ZIRAT24 Seminar Presentations

At the ZIRAT24 Seminar the following Special Topic Reports will be presented by the authors:

- Zr Alloy Manufacturing and Effects On In-reactor, DBA and Interim Storage Performance
- Fuel Reliability Assessment Through Radiochemistry and Poolside Examinations: Reactor and fuel designs, Irradiation Effects
- Mechanical Properties of Zr-Alloys, Ni-Alloys and steels, Mechanical Testing, deformation mechanisms and irradiation effects, specific effects of hydrides (Europe only)

Other technical presentations will be given at the ZIRAT24 on:

- Hydrogen - Solubility and solubility limits, diffusivity, hydrides, phase diagram, effects on dimensions (effects due to volume change and effects on growth/creep mechanisms), mechanical properties, embrittlement and DHC (USA only)
- Corrosion and HPU (USA only)
- Effects of LiOH on corrosion (USA only)
- Accident Tolerant Fuel (USA only)
- Dry Storage

Up to eight (8) persons employed by a ZIRAT24 Member organisation can attend the ZIRAT24 Seminars in America and Europe.

ZIRAT24 & ANTIA Seminar Lecturers



The presentations of the ZIRAT24 Seminars will be given by:
Dr. Kit Coleman, Dr. Sheikh Tahir Mahmood, Dr. Albert Machiels,
Dr. Charles Patterson, Dr. Malcolm Griffiths, Dr. Clément Lemaignan,
Prof. Gary Was, Dr. Audrius Jasiulevicius and Mr. Peter Rudling.

[Read more about the Network of Experts](#)

Seminar Invited Speakers



Prof. Arthur Motta is the Chair of the Nuclear Engineering Program and a Professor of Nuclear Engineering and Materials Science and Engineering at Penn State University. He holds a B.Sc. in Mechanical Engineering and an M.Sc. degree in Nuclear Engineering from the Federal University of Rio de Janeiro, Brazil, as well as a Ph.D. in Nuclear Engineering from the University of California, Berkeley. Before joining the Penn State faculty in 1992, he worked as a research associate for the CEA at the Centre for Nuclear Studies in Grenoble, France, for two years and as a post-doctoral fellow for AECL at Chalk River Laboratories in Canada.

Prof. Motta works in the area of radiation damage and environmental degradation of materials, with specific emphasis in Zr alloys. He has current projects in the areas of mechanical testing, corrosion and radiation damage. He has special interests in using advanced characterisation techniques such as x-ray scattering from synchrotron radiation sources, transmission electron microscopy, and in situ irradiation to discern fundamental mechanisms of corrosion and radiation damage.

Prof. Motta is a Fellow of the American Nuclear Society (ANS) and in 2015 he received the Mishima Award from the ANS for outstanding contributions in research and development work on nuclear fuel and materials. In 2016 he was awarded the ASTM William J. Kroll Medal for sustained impactful contributions to zirconium metallurgy including corrosion, hydriding, mechanical properties and irradiation effects.

Prof. Arthur Motta will attend the ZIRAT24 Seminar in Florida, USA.



Dr. Daniel Parrat is research engineer and was an International Expert at the Nuclear Energy Division of the CEA. He has been working in the field of nuclear fuel behaviour in Light Water Reactors and was responsible of fuel irradiation programs dealing with the release of fission products out of failed rods in normal, incidental and accidental conditions. He developed new methods and techniques for detection and characterisation of failed LWR fuel rods in power plants, for which he won a CEA prize.

He served several times as a lecturer for training sessions or workshops organised by the IAEA or the French INSTN.

He has been involved in the definition of fuel experimental programmes for the future Jules Horowitz material testing reactor (JHR) and in the design of its experimental capacity: irradiation hosting systems, non-destructive examination benches and analysis laboratories in support.

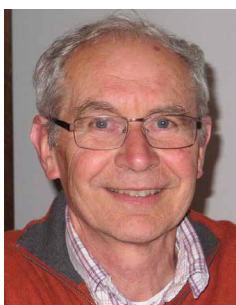
Dr. Daniel Parrat will attend both ZIRAT24 Seminars in Florida, USA and in Stockholm, Sweden



Dr. Shaohong Zhang is the President and key founder of Shanghai NuStar Nuclear Power Technology Co., Ltd, which is currently the only private company in mainland China that is capable of providing vendor-independent commercial reactor core analysis codes and related services. He obtained his degree in 1997 from Nuclear Engineering Department of Xi'an Jiaotong University, where he then worked for five years in the area of reactor physics and numerical methods. In 2002, he joined School of Nuclear Science and Engineering, Shanghai Jiaotong University and created a new reactor physics group there. He was the group leader till he quitted his professorship in 2011.

The focus of Dr. Zhang's scientific interests is LWR core analysis method and its practical applications. He is currently the committee member of Nuclear Reactor Mathematics and Computational Methods Division, Chinese Nuclear Society.

Dr. Shaohong Zhang will attend the ZIRAT24 Seminar in Florida, USA.



Dr. Gérard Ducros recently retired, spent his entire career at the French Alternative Energies and Atomic Energy Commission (CEA), studying irradiated nuclear fuel, in particular under severe accident conditions. The focus of his work was mainly dedicated to the understanding of fission product behaviour through experimental programmes (release from the fuel, transport within the reactor coolant system and behaviour into the containment). He was in particular in charge of separate effect experiments conducted by the CEA, and involved in the analysis and interpretation of integral tests, performed in the framework of the international PHEBUS-FP programme. Following the Fukushima accident in 2011, he participated in several international projects or meetings, as technical expert for OECD or IAEA. He published more than 100 papers on this topic in scientific literature or in international conference proceedings.

Dr. Gérard Ducros will attend the Accident Tolerant Fuel Seminar in Stockholm, Sweden



Dr. Martin Steinbrück graduated in chemistry at the Friedrich Schiller University Jena and received his Doctor of science in 1990. He has been at Karlsruhe Institute of Technology (formerly Forschungszentrum Karlsruhe FZK) since 1991; in that time he worked mainly in the field of Nuclear Safety Research. Dr. Steinbrück is leader of the group High-Temperature Materials Chemistry at the Institute for Applied Materials. He is in charge of the KIT project QUENCH dealing with hydrogen source term and coolability during quenching of an overheated core in the framework of the KIT program on Nuclear Safety. His special interest is the materials behaviour as well as oxidation of and interactions between the various core components at very high temperatures. Dr. Steinbrück is organiser of the annual International QUENCH Workshop (<http://quench.forschung.kit.edu/index.php>).

Dr. Martin Steinbrück will attend the Accident Tolerant Fuel Seminar in Stockholm, Sweden

ZIRAT24 Seminar Schedule

Clearwater Beach, Florida, USA.

ZIRAT24 Seminar Schedule at Sheraton Sand Key Resort — 17 – 18 March, 2020

Tuesday, March 17:

08:00-08:20	Seminar Introductory Remarks	P. RUDLING
08:20-09:00	Zr Alloy Manufacturing and Effects on In-reactor, DBA and Interim Storage Performance: Fuel Design	P. RUDLING
09:10-10:00	Zr Alloy Manufacturing and Effects on In-reactor, DBA and Interim Storage Performance: Basics	P. RUDLING & A. MACHIELS
10:00-10:20	<i>Coffee Break</i>	
10:20-11:10	Zr Source Material Manufacturing, Effects on Zr Alloy Performance During LOCA	P. RUDLING
11:20-12:20	Ingot Melting Process, Effects of Microstructure on In-pile Performance	K. COLEMAN
12:20-13:20	<i>Lunch</i>	
13:20-14:10	Cladding Tube and Guide Tube Manufacturing, Effects of Microstructure on In-pile Performance	K. COLEMAN
14:10-14:35	Effects of Microstructure on Dry Storage	A. MACHIELS
14:35-15:20	Corrosion and HPU Mechanisms	A. MOTTA
15:20-15:40	<i>Coffee Break</i>	
15:40-16:10	Hydrogen - Solubility and Solubility Limits, Diffusivity, Hydrides, Phase Diagram	K. COLEMAN
16:10-17:10	Hydrogen - Effects on Dimensions (Effects Due to Volume Change and Effects on Growth/Creep Mechanisms), Mechanical Properties, Embrittlement and DHC	K. COLEMAN
18:00	<i>Evening event & dinner</i>	

Wednesday, March 18:

08:00-09:00	Fuel Reliability Assessment Through Radiochemistry, On-line and Poolside Examinations Techniques Used to Identify and Characterise Leaking Fuel Rods	D. PARRAT
09:10-10:10	Fuel Reliability Assessment Through Radiochemistry and Poolside Examinations: Documentation Specific to Back End (Storage and Transportation) of Fuel Cycle	A. MACHIELS
10:10-10:30	<i>Coffee Break</i>	
10:30-10:45	Panel Discussion	P. RUDLING
10:45-11:35	TBD	TBA
11:35-12:35	<i>Lunch</i>	
12:35-14:15	Accident Tolerant Fuel	T. MAHMOOD, G. WAS
14:15-14:35	<i>Coffee Break</i>	
14:35-15:20	Accident Tolerant Fuel – <i>cont.</i>	K. COLEMAN
15:20-15:30	Panel discussion	KC, GW, TM
16:40-17:00	Dry Storage	A. MACHIELS
	<i>Coffee Break</i>	

17:00-17:20	Dry Storage – <i>cont.</i>	A. MACHIELS
17:20-17:30	Panel Discussion	A. MACHIELS
17:30-17:50	Seminar Conclusion & Feedback	P. RUDLING

Please note that the ZIRAT24 Seminar starts at 8:00 on March 17 and ends at 17:50 on March 18.

[Download the printable schedule](#)

LCC15 Seminar Schedule

Stockholm, Sweden

LCC15 Seminar Schedule at Stockholm, Sweden — 15 – 17 April, 2020

Wednesday, April 15th:

08:00-08:30	Seminar Introductory Remarks	P. RUDLING
08:30-10:00	Coolant Chemistry for PWR and VVER; Guidelines Basis	S. ODAR
10:00-10:25	<i>Coffee Break</i>	
10:25-12:00	Secondary System; Treatment, Corrosion, Materials Behaviour	F. NORDMANN
12:00-13:20	<i>Lunch</i>	
13:20-14:10	Coolant Chemistry for PWR and VVER; Guidelines Basis – <i>cont.</i>	S. ODAR
14:20-15:00	Chemistry Transients on NPP Materials & Performance	S. HETTIARACHCHI
15:00-15:30	<i>Coffee Break</i>	
15:30-17:00	Chemistry Transients on NPP Materials & Performance – <i>cont.</i>	S. HETTIARACHCHI
18:00	<i>Evening event & dinner</i>	

Thursday, April 16th:

08:00-10:00	Coolant Chemistry for PWR and VVER; Guidelines Basis – <i>cont</i>	S. ODAR
10:00-10:30	<i>Coffee Break</i>	
10:30-12:00	Secondary System; Treatment, Corrosion, Materials Behaviour – <i>cont</i>	F. NORDMANN
12:00-13:20	<i>Lunch</i>	
13:20-14:20	Secondary System; Treatment, Corrosion, Materials Behaviour – <i>cont</i>	F. NORDMANN
14:35-15:00	Coolant Chemistry for PWR and VVER; Guidelines Basis – <i>cont</i>	S. ODAR
15:00-15:30	<i>Coffee Break</i>	
15:30-17:00	Coolant Chemistry for PWR and VVER; Guidelines Basis – <i>cont</i>	S. ODAR

Friday, April 17th:

08:00-10:00	Fuel Crud in LWR	J. CHEN
10:00-10:30	<i>Coffee Break</i>	
10:30-10:50	Fuel Crud in LWR – <i>cont</i>	J. CHEN
11:00-11:30	Coolant Chemistry for PWR and VVER; Guidelines Basis – <i>cont</i>	S. ODAR
11:30-12:00	Seminar Conclusion & Feedback	

Please note that the LCC15 Seminar starts at 8:00 on April 15th and ends at 12:00 on April 17th.

[Download the printable schedule](#)

ZIRAT24 Seminar Schedule

Stockholm, Sweden

ZIRAT24 Seminar Schedule at Stockholm, Sweden — 20 - 22 April, 2020

Monday, April 20:

08:00-08:40	Seminar Introductory Remarks	M. STRAND
08:40-09:00	Zr Alloy Manufacturing and Effects on In-reactor, DBA and Interim Storage Performance: Fuel Design	P. RUDLING
09:10-10:00	Zr Alloy Manufacturing and Effects on In-reactor, DBA and Interim Storage Performance: Basics	P. RUDLING
10:00-10:20	<i>Coffee Break</i>	
10:20-11:10	Zr Source Material Manufacturing, Effects on Zr Alloy Performance During LOCA	P. RUDLING
11:20-12:00	Ingot Melting Process, Effects of Microstructure on In-pile Performance	K. COLEMAN
12:00-13:00	<i>Lunch</i>	
13:00-13:50	Cladding Tube and Guide Tube Manufacturing, Effects of Microstructure on In-pile Performance	K. COLEMAN
14:00-14:50	Strip and Sheet Manufacturing, Effects of Microstructure on In-pile Performance	P. RUDLING
14:50-15:10	<i>Coffee Break</i>	
15:10-15:35	Effects of Microstructure on Dry Storage	P. RUDLING
15:35-15:50	Panel Discussion	P. RUDLING
16:00-16:30	Workshop on Zr Alloy Manufacturing	A. JASIULEVICIUS
18:00	<i>Evening event & dinner</i>	

Tuesday, April 21:

08:00-09:00	Mechanical Properties of Zr-Alloys, Ni-Alloys and Steels	K. COLEMAN, M. GRIFFITHS, C. LEMAIGNAN
09:10-10:00	Mechanical Property Testing Techniques	T. MAHMOOD
10:00-10:20	<i>Coffee Break</i>	
10:20-11:00	Deformation Mechanisms and Irradiation Effects	M. GRIFFITHS, C. LEMAIGNAN
11:10-12:00	Specific Effects of Hydrides	K. COLEMAN
12:00-12:15	Panel Discussion	K. COLEMAN, A. JASIULEVICIUS
12:15-13:15	<i>Lunch</i>	
13:15-14:15	Invited Presentation	S. ZHANG
14:30-15:10	Cladding Creep Collapse	A. JASIULEVICIUS
15:10-15:30	<i>Coffee Break</i>	
15:30-16:30	Fuel Reliability Assessment Through Radiochemistry, On-line and Poolside Examinations Techniques Used to Identify and Characterise Leaking Fuel Rods	D. PARRAT

Wednesday, April 22:

08:00-09:00	Fuel Reliability Assessment Through Radiochemistry and Poolside Examinations: Fuel Reliability Primary Failure Causes, Secondary Degradation	A. JASIULEVICIUS
09:10-10:00	Fuel Reliability Assessment Through Radiochemistry and Poolside Examinations: Documentation Specific to Back End (Storage and Transportation) of Fuel Cycle	A. MACHIELS
10:00-10:20	<i>Coffee Break</i>	
10:20-12:15	Interim Dry Storage	A. MACHIELS
12:15-13:00	Panel Discussion // Seminar Conclusion & Feedback	A. JASIULEVICIUS

Please note that the ZIRAT24 Seminar starts at 8:00 on April 20 and ends at 13:00 on April 22.

[Download the printable schedule](#)

ANTIA Seminar Schedule

Accident Tolerant Fuel – A.N.T. International Academy

ANTIA Seminar Schedule at Stockholm, Sweden — 23 – 24 April, 2020

Thursday, April 23:

08:00-08:30	Seminar Introductory Remarks	M. STRAND
08:30-09:30	The Fukushima Accident; Description of the Main Events Leading to New Safety Requirements	G. DUCROS
09:40-10:20	Benefits of ATF	T. MAHMOOD
10:20-11:00	ATF Cladding Concepts – Part 1	T. MAHMOOD
11:00-11:15	<i>Coffee Break</i>	
11:15-12:15	ATF Cladding Concepts – Part 2	T. MAHMOOD
12:15-13:15	<i>Lunch</i>	
13:15-14:15	High-temperature Oxidation of Promising ATF Cladding Materials	M. STEINBRÜCK
14:15-14:45	<i>Coffee Break</i>	
14:45-15:45	Performance under normal operating conditions and what is missing in the testing of these concepts	G. WAS

No evening event or dinner is planned for this seminar

Friday, April 24:

08:00-09:00	Manufacturing Issues	K. COLEMAN
09:15-10:15	ATF Concepts	C. PATTERSON
10:15-10:45	<i>Coffee Break</i>	
10:45-11:45	Dry Storage	A. MACHIELS
11:45-13:00	<i>Lunch</i>	
13:00-14:00	Licensing	TBD
14:15-14:45	Cost Considerations	TBD
14:45-15:45	Panel Discussion // Seminar Conclusion & Feedback	

Please note that the Accident Tolerant Fuel Seminar starts at 8:00 on April 23 and ends at 15:45 on April 24.

[Download the printable schedule](#)

Hotel in Clearwater Beach, Florida



Sheraton Sand Key Resort

17 – 18 March, 2020

Address: 1160 Gulf Blvd., Clearwater Beach,
33767 Florida, USA

Phone: +1 727 595 1611

Fax: +1 727 593 6004

Website: [Sheraton Sand Key Resort](http://www.sheraton.com/sandkeyresort)

Room reservations

Click the button below to make a room reservation online:

BOOK A ROOM

Singles/doubles rate is \$246.00 plus tax, per night. A number of rooms are being held for the nights of March 14, 2020 – March 18, 2020. (checking out on March 19, 2020).

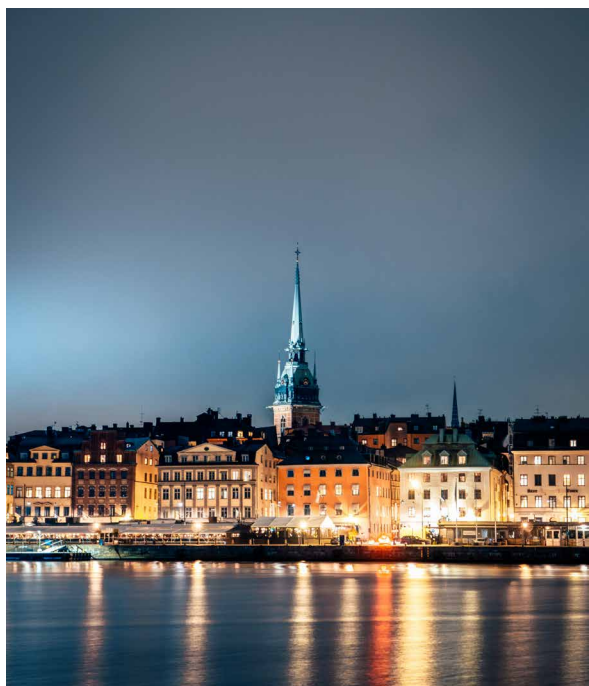
Reservations must be made at the latest on February 14, 2020, after which no rooms will be held. We strongly recommend that you make your reservation as soon as possible even though you may not know the name of the person who will attend, it is easier to cancel a reservation than to make a late one.

Please note that any room cancellation must be done no later than 48 hours prior to arrival, or the cost of the room will have to be paid. The Seminar participants should pay for the hotel room charge when checking out from the hotel.

If you need assistance, please contact us via e-mail: seminar@antinternational.com

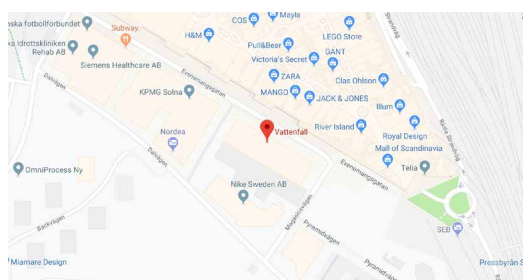


Seminar location in Stockholm, Sweden



A.N.T. International Annual Seminars 2020, will be celebrated in Stockholm, Sweden at **Vattenfall Evenemangsgatan 13 C, 16979 Solna, Sweden**

To download the location to your phone/computer, click on the map below.



Regarding accommodation, each participant is responsible for booking his/her own room. Here are some recommendations of hotels that are close to the Seminar venue:



Quality Hotel™ Friends

Råsta Strandväg 1, 169 56 Solna, Sweden
About 37 km from Arlanda Airport
About 300 m from Vattenfall venue

Phone: +46 8 705 70 00

E-mail: reservations.friends@choice.se

Booking: [Quality Hotel Friends](#)



Best Western Plus Grow Hotel

Landsvägen 30, 171 54 Solna, Sweden
About 37 km from Arlanda Airport
About 3 km from Vattenfall venue

Phone: +46 8 557 607 00

E-mail: info@growhotel.se

Booking: [Best Western Plus Grow Hotel](#)

If you need assistance, please contact us via e-mail: seminar@antinternational.com

Seminar Registration & Prices

In addition to hotel/room reservation, you must also register for the ZIRAT24, LCC15 and A.N.T. International Academy Seminars. Attention! Each participant must be registered for the Seminar.

Please fill out the online registration form at: www.antinternational.com/seminars2020



A.N.T. INTERNATIONAL ACADEMY – SEMINAR PRICE

1.5-DAY SEMINAR

No. of participants	1	2	3	4	5	6	7	8
Price p/p (EUR)	1 700	1 625	1 625	1 550	1 550	1 450	1 450	1 450
Total price (EUR)	1 700	3 250	4 875	6 200	7 750	8 700	10 150	11 600

For non ZIRAT/IZNA/LCC members the price is EUR 500 p/p higher than in the table.

Contact us for additional information: seminar@antinternational.com



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