Päivi Lampinen 14.3.2014

50 v. JUHLATOIMIKUNNAN KOKOUS II/2014

PAIKKA Lync-puhelinkokous
AIKA 13.3.2014, klo 13.00-14.00

OSALLISTUJAT:

Timo-Pekka Veijonen	Stora Enso Pulp Competence Center (Lync)
Esa Vakkilainen	Lappeenrannan Teknillinen Yliopisto (Lync)
Päivi Lampinen	Pöyry Finland Oy

LIITTEET:

50 vuotisjuhlakirjan taittomalli
ICRC ohjelmalehtinen (alustava)

1 POISSAOLOILMOITUKSET

Keijo Salmenoja	Andritz Oy
Klaus Niemelä	VTT
Mikko Hupa	Åbo Akademi (Lync)
Markus Nieminen	Pöyry Finland Oy

2 TILANNEKATSAUS

Alla olevassa taulukossa on listattu lyhyesti tapahtuman tärkeimpiä asioita ja niiden tämän hetkinen tilanne. Punaisella kokouksessa päätetyt asiat.

Asia:	**Tilanne:**
50v-juhlapäivän teema	Päätetty "*Continuous development of recovery boiler technology – 50 years of cooperation in Finland*"
50v-seminaarin luennoitsijat	Päätetty, tiedotettu luennoitsijoita, VTT/Pohjanne ja Mäkipää vahvistus puuttuu Sessioiden nimet päätetty 1. Opening Session 2. Recovery Boiler Development 3. Status of Recovery Boilers 4. International Recovery Boilers
50v-juhlakirja	Taittopohja tehty ja lähetetty juhlatyöryhmälle kommentoitavaksi. Yksi teksti tullut (Andy Jones) Muistutusmeili luennoitsijoille (Markus/Päivi) ja kuvapyyntö, **deadline 31.3.2014**
ICRC ohjelmalehtinen	Ensimmäinen versio tehty (A5-koko = taitettu A4) ja lähetetty juhlatyöryhmälle kommentoitavaksi. Päivi tekee muutokset, lisäykset yms kommenttien perusteella, jonka jälkeen lähettää vielä Reyhaneh Shenassalle ja Allan Walshille kommentoitavaksi.
Puoliso-ohjelma	Päätettiin kolme ohjelmaa: - Päiväristeilu - Tampereen kävelykierros - Ostoskierros kävellen Päivi selvittelee Tampereen matkailutoimiston kautta
Nettisivut, rekisteröinti+hotellivaraus	Tehty. Hotelliyöpymiset maksetaan ICRC puheenjohtajistolle (Keijo, Reyhaneh sekä Allan), huom! Muistakaa kaikki ilmoittautua
Budjetti	Tehty ja hyväksytty
Osallistujamaksut	Tehty
Excursiot 13.6.	Kymi OK, Rauma OK -> Mainokset tehty Hinta 100 eur/hlö

Sponsorointivaihtoehdot	Näyttelyyn 6 varausta, ohjelmalehteen 1 mainosvaraus, Valmet kaulanauhasponsorina
50 v-konferenssin iltaohjelma	Päätetty (Werner Brothers), tekniikasta tarjous
Osallistujalahja (reppu 50 v-logolla)	Reppu tilattu
Historiikki	Tarjous hyväksytty, kirjoitustyö alkanut maaliskuussa
Avauspuhuja, maanantai 9.6	Esa Härmälä, TEM energiaosaston ylijohtaja
Call for Papers	Ilmoittautuminen päättynyt, ICRC esitelmät päätetty, luennoitsijoille ilmoitettu
Yhteistyöjärjestöt	TAPPI, PI, APPITA, PACTAC (jäsenhinta)
Mainostus	ABTCP, CSCRB, AF&PA, BRLBAC, SHK, erilaiset nettisivustot
TAPPI sopimus	Tehty

3 50 VUOTISJUHLAKONFERENSSIN ESITELMÄT

NO	AUTHOR	SUBJECT	SESSION CHAIR
	SESSION 1	**OPENING SESSION**	**Timo Merikallio**
	FRBC Chairman Timo Merikallio	Opening words	OK
1.	Mikko Hupa, Åbo Akademi	Recovery boiler research highlights – 10 steps forward	OK
2.	Esa Vakkilainen, LUT	Recovery boiler history and future	OK
	SESSION 2	**RECOVERY BOILER DEVELOPMENT**	**Esa Vakkilainen**
3.	Ari Kankkunen, Aalto Yliopisto	Review of black liquor spraying	OK
4.	Honghi Tran, University of Toronto	Review of recovery boiler soot blowing	OK
6.	Pekka Pohjanne, Martti Mäkipää, VTT	SKYREC:n seinä/tulistin materiaalit tutkimukset	Vahvitus puuttuu
	SESSION 3	**STATUS OF RECOVERY BOILERS**	**Timo-Pekka Veijonen**
7.	Song Won Park, University of Sao Paulo	Utilizaton of process data in recovery boilers	OK
8.	Kari Haaga, Valmet	XXL recovery boilers	OK
9.	Marja Heinola, Andritz	Review of high energy recovery boilers	OK

	SESSION 4	INTERNATIONAL RECOVERY BOILERS	Honghi Tran
10.	Andy Jones International Paper	CFD modelling of kraft recovery boilers – a retrospective	OK
11.	Rikard Gebart, Luleå University of Technology	Review of the black liquor gasification activities	OK
12.	FRBC, SHK, BLRBAC, ABTCP	Reports from around the world	15 minuutin esitykset / tervehdykset per yhdistys

4 SEURAAVA KOKOUS

Seuraava kokous päätetään myöhemmin.

LIITE I

50 vuotisjuhlakirjan alustava taitto

50 YEARS RECOVERY BOILER CO-OPERATION IN FINLAND

SUOMEN SOODAKATTILAYHDISTYS
FINNISH RECOVERY BOILER COMMITTEE

CONTINUOUS DEVELOPMENT OF RECOVERY BOILER TECHNOLOGY – 50 YEARS OF COOPERATION IN FINLAND

INTERNATIONAL RECOVERY BOILER CONFERENCE, Tampere Hall, June 11, 2014

SUOMEN SOODAKATTILAYHDISTYS
FINNISH RECOVERY BOILER COMMITTEE

CONTINUOUS DEVELOPMENT OF RECOVERY BOILER TECHNOLOGY – 50 YEARS OF COOPERATION IN FINLAND

PROCEEDINGS

INTERNATIONAL RECOVERY BOILER CONFERENCE
Tampere Hall, Tampere, June 11, 2014

SUOMEN SOODAKATTILAYHDISTYS
FINNISH RECOVERY BOILER COMMITTEE

50th ANNIVERSARY INTERNATIONAL
RECOVERY BOILER CONFERENCE

Tampere Hall, Tampere, June 11, 2014

Finnish Recovery Boiler Committee
P.O. Box 4, Jaakonkatu 3
FI-01621 Vantaa
FINLAND
Telephone + 358 10 3311
www.soodakattilayhdistys.fi

Cover photos:
Scenery of pulp mill at Stora Enso Oyj, Kaukopää, Imatra
Tampere Hall, Tampere

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Welcoming words x
Timo Merikallio

Review of recovery boiler research highlights - 10 steps forward x
Mikko Hupa

Recovery boiler history and future x
Esa Vakkilainen

Review of black liquor spraying x
Ari Kankkunen

Review of recovery boiler sootblowing x
Honghi Tran

Review of recovery boiler superheater material studies x
To be confirmed

Utilization of process data in recovery boilers x
Song Won Park

XXL recovery boilers x
Kari Haaga

Review of high energy recovery boilers x
Marja Heinola

CFD modeling of kraft recovery boilers - a retrospective x
Andy Jones

Review of the black liquor gasification activities x
Rikard Gebart

WELCOMING WORDS

TIMO MERIKALLIO
METSÄ FIBRE OY

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CFD MODELING OF KRAFT RECOVERY BOILERS - A RETROSPECTIVE

ANDREW JONES
INTERNATIONAL PAPER
UNITED STATES

Abstract

Progress in the field of Kraft recovery boiler modeling is assessed by retrospectively looking at the proceedings of the 1991 Timberline Colloquium on Recovery Boiler Modeling1. The focus being on: the players involved then and now; the extent to which gaps have been closed since this colloquium and progress (or lack thereof) that has occurred since the time of this meeting.

Introduction

The 1991 Timberline Conference was the first large gathering of those interested in developing Kraft recovery boiler CFD capability, using CFD models and validating the results. It was a coming of age of this technology that had its infancy in the late 1980's.

Organized by Weyerhaeuser and B&W, two early leaders in this development activity, the conference had 51 attendees. I will delve a bit more into the attendees and their affiliations later in the paper.

Before diving into this topic we need to ask: What is the intent of this retrospective? I believe a proper study of history can provide valuable insight. The following are a few quotes that I borrowed from the American Historic Association2.

. . . the changing perspectives of historical understanding are the very best introduction we can have to the practical problems of real life.
Clearly we need careful reflection about, and search for, enduring patterns and critical turning points in the past, for these are the historical facts that everyone needs to know ...

... ignorance of history--that is, absent or defective collective memory--does deprive us of the best available guide for public action ...

This gives me my cue on how to go about this presentation: how has our understanding of CFD for Kraft recovery boilers changed in the intervening time, what does this tell us about the problem of modeling, verifying and using CFD models; can patterns be extracted from the application of this technology that we can learn from and guide us moving forward; and how can this presentation be best used to retaining this knowledge so we can be guided going forward, so that this valuable tool can continue to become more useful.

I would be remiss in not mentioning the location, just outside of Portland, Oregon; the Timberline Lodge is located above the tree line on Mt. Hood, a dormant volcano in the cascades range. The lodge was completed in 1938 by the Works Progress Association (WPA). Many of you may have unwittingly seen footage of the lodge in the movie "The Shining" (red rum, red rum…). One of the snowiest places on earth it averages 14 meters per year. I encourage anyone visiting the Portland area to make the trek up to the lodge and stay at least one night. An old photo taken in 1943 is shown in Figure 1.

Figure 1 - Old image of Timberline Lodge Circ 1943 - USFS photo #424587 by George Henderson

So let's look back 23 years, before some of the audience was born and when most of us had far less gray hair.

Attendees and Affiliations

As mentioned previously Weyerhaeuser and B&W were the organizers of the Colloquium. The introduction to the colloquium was given by Denny Hunter and Joe Barsin. Denny has recently retired from Weyerhaeuser. Most recently he was CTO at Catchlight Energy, the Weyerhaeuser-Chevron Joint-Venture for biofuels development. Joe Barsin, a long-time B&W employee retired a number of years ago but still remains active as a consultant.

The two keynote presentations are very informative and were given by two very well known researchers: Dr. Rolf Collin of the Royal Institute of Technology (KTH) and Dr. Martha Salcudean at the University of British Columbia. Both of these institutions have continued active research into CFD development but with distinctly different directions. UBC developed their own code, using multigrid segmentation and advanced solvers, eventually spinning off a company, Process Simulations Limited that continues to provide modeling service on Kraft recovery boilers and a variety of other pulp and paper process equipment. KTH based on subsequently published research has made extensive use of FLUENT a commercial code as a basis for the development of useful sub-models. These two different pathways will be touched on again later in the talk.

The other theme that is also worth considering is that of physical flow modeling as a basis for the validation of CFD and also as a valuable trouble-shooting tool in its own right. Rolf described a technique where acid-alkali reactions are used to simulate mixing as a way to predict NOx emissions on a utility boiler. This theme will also be touched on further.

The other early pioneers on the attendee list included: Dr. Tom Grace, who led the development of the first comprehensive CFD model at the Institute of Paper Chemistry in the 1985-1989 time frame; Two of his team members were in attendance, myself then representing ABB, and Allan Walsh, representing the J.H. Jansen Company. Allan continues to work in the field to this date; Woody Fiveland was also present, he was working for B&W, another company that has successfully developed and maintained their own CFD models to this date. Rick Wessel has long since taken over Woody's efforts at B&W; Tampere University represented by Reijo Karvinenen and Tampella represented by Pekka Siiskonen were already active in sub-model development using FLUENT.

There were no representatives of FLUENT at the meeting, but there were a number of end users of the commercial code, Gotaverken, Ahlstom, Tampella, Jansen, ABB and perhaps some others. I will touch on FLUENT's role in Kraft CFD development a bit more later on.

I've attempted to describe the attendees based on four different categories at the time of the meeting: CFD model user, CFD model developer, Validators – interested in proving value of CFD modeling, and other interested parties.
CFD Model Developers – IPST, ABB, Jansen, B&W, KTH, UBC, Tampere University, BYU (for Utility boilers mostly).
CFD Model Users – Gotaverken, Ahlstom, Oy Polyrec, Chemrec, Tampella (all using FLUENT)
Validators – Paprican, Quest Integrated, Sandwell, Weyerhaeuser (also a user of the UBC code), Advanced Fuel Research.

Interested parties - Longview Fiber, University of Toronto, U.S. DOE, International Paper, Abo Akademi, James River, Kimberly Clark, Swedish Pulp and Paper Research Institute. None of these attendees presented at this meeting. Within this group are two academic organizations (The University of Toronto and Abo Akademi) that have become critical contributors to model development, taking over from IPST. I believe some of the catalyst for taking on these roles was provided by this colloquium.

The Topics

There were 5 topic areas: Combustion Fundamentals, Physical Modeling of Recovery Boilers, The Role of Models in Boiler Design, Computer Modeling of Recovery Boilers and Model Validation.

I will not address all of the individual presentations, but rather just touch on some of the highlights.

The combustion fundamentals work highlighted research on the burning properties of black liquor a topic that has been a key research topic to this day. Many PhDs have been received in an effort to fully examining this topic. A full understanding of these fundamentals is essential if accurate predictive CFD models are to be developed. A vital partnership exists between these developers of fundamental models suitable for CFD application and those using CFD to predict recovery boiler operation. The need for this partnership was recognized very early on in the development of Kraft recovery boiler CFD models. This session ended with a panel discussion on char bed combustion. What was most interesting in this session was the discussion for a need for a dynamic char bed model that could predict the influence of operating parameters on char bed shape. It took another 17 (!) years to develop this type of model as described in a recent paper by Markus Engblom.3

The next session on the physical modeling of recovery boilers is a research area that most young engineers are probably not very familiar with. Before the rise of CFD, physical models were the only tool for predicting gas flows and mixing in combustion equipment. Early in the development of recovery boiler CFD models, validation of CFD results versus physical modeling results was an active research area. It was this work that allowed us to gain confidence in the CFD results, and in some case grave doubts… There are still some cases, such as very complex geometries, where only recently has CFD modeling advanced sufficiently to replace the utility f physical models.

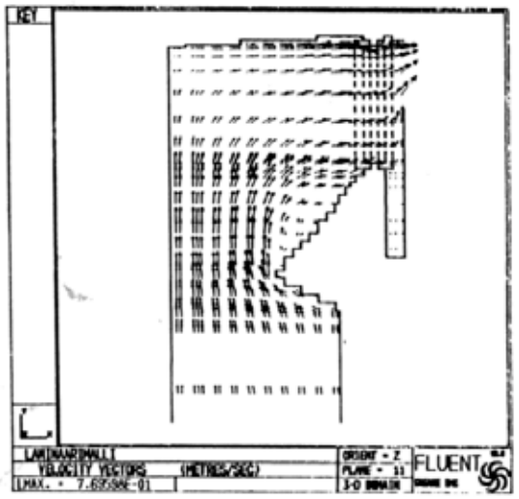

Figure 2 - Ahlstom Recovery Boiler "Slice" Model

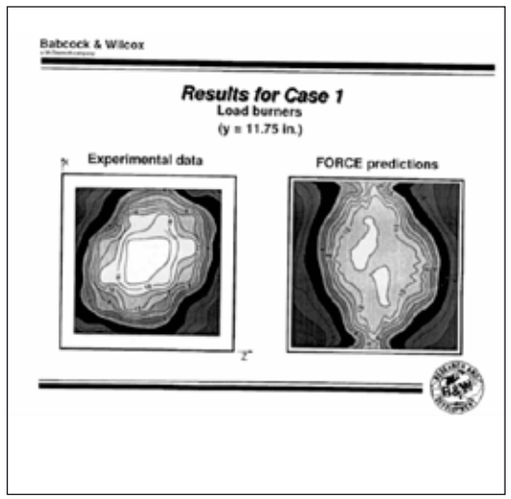

Figure 3 - Early B&W Recovery Boiler CFD results

In a subsequent panel discussion on the role of CFD on recovery boiler design the remarkable fact that B&W has been doing computational flow modeling since 1971 was mentioned. Some early Kraft recovery boiler modeling results are shown in Figure 2. ABB, Ahlstrom (some early results shown in Figure 3), Tampella and Gotaverken also presented examples of CFD being used for recovery boiler design, some of the earliest references to the work of recovery boiler vendors in this field. These modeling efforts have continued to this day the players have new names though, Metso (Valmet now!), Andritz and Alstom. It has been a very interesting history of recovery boiler manufactures, but that is a topic for another day.

The next session on computer modeling of recovery boilers had a paper from Bob Horton of IPST, Bob led the modeling effort at IPST in the early 1990's. Work was completed on a DOE project focused on improving droplet modeling and char bed modeling in Kraft recovery boilers and integrating this work into the FLUENT code. Martha Salcudean also presented a paper in this session that described the innovative work that was going on at the University of British Columbia at this time. They were using a code called TEACH, that used high order differencing schemes and multi-grid techniques, improvements that would be adopted by commercial codes. Woody Fiveland of B&W then presented cold flow modeling results using FORCE a very early version of the (COMO-PR™) code that they have extensively developed since this time for Kraft recovery boiler modeling applications. The last session on validation presented a few ideas on how to take in-situ measurements in a recovery boiler. It is unclear if either of the techniques: acoustic Doppler, or FT-IR have ever been successfully applied to recovery boiler in-situ measurement.

Observations

In reviewing the Timberline Colloquium a few general observations can be made:

1. FLUENT played a key role in Kraft Recovery boiler CFD development, initially by provide access to source code (IPC development), and then later on by the use of user defined subroutines that provided a window into their code. While obviously a commercial company interested in selling modeling code it seems to me they went above and beyond this role in the level of support they provided to code developers;
2. The concept of using academic organization to develop sub-models for use in the commercial code of vendors had its genesis at about this time. IPC and Tampere University had already begun these efforts and in the next few years activities at both Abo Akademi and the University of Toronto began. The DOE represented by Stan Sobszynski at this meeting went on to play a key role in funding the early code development activities in this field at both of these institutions. Contact at this meeting certainly played a role in these efforts;
3. A number of topics were not even discussed in this meeting including simulation of sootblower jets, modeling of fume deposition. Modeling of fume formation and modeling char bed growth were on the wish list but no efforts had been started at this time;
4. We have made significant progress since meeting in a number of areas: validation, using CFD as a design tool, using CFD as a troubleshooting tool, modeling gaseous emission levels – NOX, CO, O2, and carry-over predictions;
5. There is a surprising continuity of players in this field. Many of the names from this conference are still active in the field. A number of new players have entered including the University of Toronto, Aalto University, Abo Akademi, Tampere University, and Umea University.

Conclusions

1. Two valid paths of code development have been proven: build your own code (e.g. PSL, B&W and using a commercial code (e.g. Andritz, Metso, Jansen). The second method has the advantage of being better able to support the inclusion of user defined sub-routines as the work product from others and in being able to rely on the software vendors to implement improvements to the general code. The "build your own" approach allows for possible competitive advantages in the quality of results and the control of the overall code. History has thus told us that there is a place for both of these approaches. Thus any user subroutine should be available as both user defined subroutines and as descriptive algorithms that can be then adapted by the do-it-yourself developers;
2. Academic organization have played a key role in sub-model development (usually freely available), the commercial code users can more easily benefit from these "open-sourced" models. This synergist relationship has many benefits and must be supported going forward;
3. Academic organizations need sources of funding in order to play this role. In the U.S. the DOE played this role, in Finland the support of TEKES has been vital.
4. What we did not even see in 1991 are now active areas of code development, not really a surprise but reassuring. Additional novel modeling applications must be pursued. One such idea is the ability to model growth and removal of deposits by sootblowers;
5. Validation is still elusive, some progress has been made but more work needs to be done. Getting validation data from an operating recovery boiler is a challenge and we need to continue to pursue means to do this.

On final point is that I have a copy of the proceedings from the 1991 Timberline Colloquium, I would be happy to make additional copies for anyone interested. Please contact me via e-mail if you would like a copy.

References

1. *Timberline Colloquium on Recovery Boiler Modeling – April 10-13, 1991. Available upon request.*
2. *http://www.historians.org/about-aha-and-membership/aha-history-and-archives/archives/why-study-history-(1985) American Historic Association.*
3. *"Toward predicting the char bed shape in kraft recovery boilers"; Engblom, Markus; Mueller, Christian; Brink, Anders; Hupa, Mikko; Jones, Andrew; TAPPI Journal, v 7, n 10, p 12-16, October 2008*

LIITE II

ICRC konferenssiohjelma (alustava)

SUOMEN SOODAKATTILAYHDISTYS
FINNISH RECOVERY BOILER COMMITTEE

TAPPI

2014 International Chemical Recovery Conference and 50th Anniversary Conference of the Finnish Recovery Boiler Committee

PROGRAMME

Tampere (Tampere Hall)
Finland
June 8-13, 2014

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Introduction

Conference programme committee

Tampere Hall

Programme

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INTRODUCTION

Suomen Soodakattilayhdistys, The Finnish Recovery Boiler Committee, TAPPI, PACTAC, APPITA and PI are presenting the 2014 International Chemical Recovery Conference (ICRC) in Tampere, Finland. Held every three years since the 1980s, this is the preeminent conference in the area of chemical recovery technology in the pulp and paper industry.

Year 2014 will also mark the 50th year of recovery boiler cooperation in Finland. To celebrate the occasion, a special session is arranged by the Finnish Recovery Boiler Committee.

The conference will focus on all areas of Chemical Recovery including: environmental quality, improvements in recovery operations, benefits of new technology, and technical descriptions of successful solutions.

Warmly welcome to attend the ICRC in Tampere!

CONFERENCE PROGRAMME COMMITTEE

Conference Chairman
Keijo Salmenoja Andritz Oy

TPC Co-Chairs
Senior TPC Chair: Allan Walsh, Jansen Combustion & Boiler Tech.
Junior TPC Chair: Reyhaneh Shenassa, Valmet

Advisory Committee
Mikko Hupa, Åbo Akademi University
Honghi Tran, University of Toronto
Andy Jones, International Paper
Jim Frederick Jr. , Table Mountain Consulting LLC
Tom Grace, T.M. Grace Company Inc.
Rikard Gebart, Luleå University of Technology
Hans Theliander, Chalmers University of Technology

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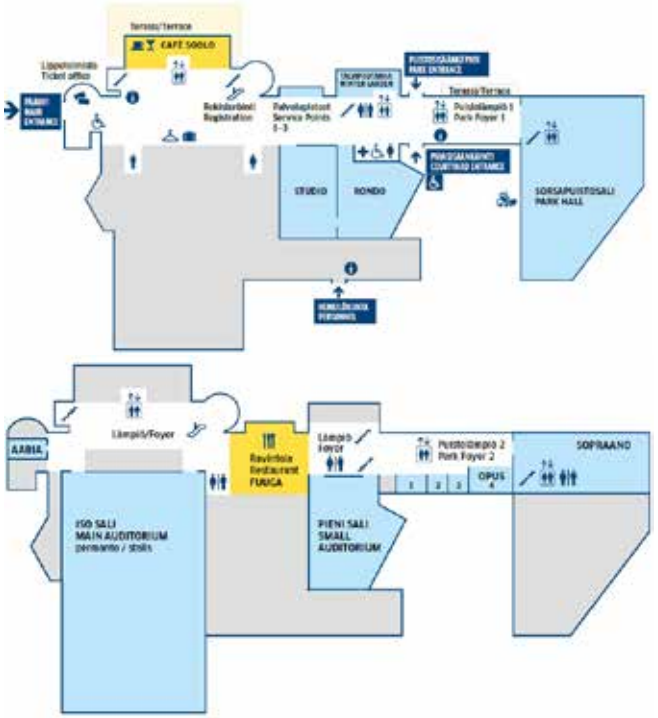
Niklas Berglin, Innventia AB
Maria Björk, Stora Enso
Timothy Hicks, Babcock & Wilcox Power Generation Group
Pasi Miikkulainen, Andritz Oy
Afonso Pereira, IBASE
Peter Ryder, Pöyry
Erkki Välimäki, Valmet
Danny Tandra, Clyde Bergeman
Alarick Tavares, Georgia-Pacific Corporation
Esa Vakkilainen, Lappeenranta University of Technology
Timo-Pekka Veijonen, Stora Enso
Chris Verrill, International Paper
Kevin Whitty, University of Utah
Patrik Yrjas, Åbo Akademi University
Douglas Singbeil, FPInnovations

TAMPERE HALL

Tampere Hall was inaugurated in 1990 and is the largest congress and concert centre in Scandinavia. The building was designed by architects Sakari Aartelo and Esa Piironen. Tampere Hall is located in Tampere on the edge of Sorsapuisto Park, just across the road from the main building of Tampere University and within a short walking distance of the city centre.

Tampere Hall is deeply respected and loved by its clients and has been voted the best congress venue in Finland on three separate occasions. Tampere Hall's state-of-the-art facilities have been carefully designed to create an exciting, modern and dynamic venue for concerts, conferences, congresses and exhibitions.

Since opening its doors in 1990, Tampere Hall has hosted a great number of international congresses and world-class music performances.



TECHNICAL PROGRAMME

PROGRAMME SUNDAY JUNE 8, 2014

17:00 – 20:00 **Get Together Event and Speakers Briefing**
Tampere Hall, Yliopistonkatu 55, 33100 Tampere, Finland

PROGRAMME MONDAY JUNE 9, 2014

08:00-> Registration open (1st floor)

09:00 – 17:00 Exhibition (2nd Floor)

08:30 – 09:00 ***WELCOME / INTRODUCTION (Small Auditorium, 2nd floor)***
Keijo Salmenoja, Allan Walsh

09:00 – 10:00 ***ICRC PLENARY SESSION 1 (Small Auditorium, 2nd floor)***
Session Chairman: Keijo Salmenoja

Keynote speech:
Esa Härmälä, Director-General, Ministry of Employment and the Economy

Overview of highlights of research in chemical recovery
Honghi Tran, University of Toronto

10:00 - 10:30 ***Coffee Break + Exhibition (2nd Floor)***

10:30 – 12:00 ***ICRC PLENARY SESSION 2 (Small Auditorium, 2nd floor)***
Session Chairman: Allan Walsh

Kraft recovery boiler dust chemistry – implications from operating boilers
Keijo Salmenoja, Andritz Oy

Evaporation of lignin lean black liquor
Henrik Wallmo, Valmet

Critical evaluation of new EU IPPC BAT BREF for kraft pulp mill emissions to air
Esa K. Vakkilainen, Lappeenranta University of Technology

12:00 - 13:00 ***Lunch + Exhibition (2nd Floor)***

PROGRAMME MONDAY JUNE 9, 2014

13:00 – 14:30

SESSION 1A
RECOVERY BOILER DESIGN & OPERATION
Session Chairman: Erkki Välimäki

Maximizing the electricity generation capacity of recovery boilers in japanese pulp and paper mills
Yoshihisa Arakawa, ZEON Corporation

Increasing electricity generation from recovery boilers
Esa K. Vakkilainen, Lappeenranta University of Technology

Closing of a recovery boiler –a success story!
Anders Fransson, Valmet

SESSION 1B
CHEMICAL RECOVERY CYCLE – RECAUSTICIZING
Session Chairman: Venki Venkatesh

New challenges regarding non-process elements in the liquor / lime cycle
Marta Bialik, Innventia AB

Optimizing the recausticizing area to maximize pulp production
Kraig R. Kent, Ashland Water Technologies

Results and benefits of re-causticizing plant optimization using a novel advanced process control technique
Vivek Rajbhandari, Texo Consulting and Controls

14:30 - 15:00 — *Coffee Break + Exhibition (2nd Floor)*

15:00 – 17:00

SESSION 2A
RECOVERY BOILER OPERATION AND ENERGY EFFICIENCY
Session Chairman: Andy Jones

Improving energy efficiency of existing recovery boilers
Jarmo Mansikkasalo, Valmet

CFD modeling of sootblower jets
Shahed Doroudi, University of Toronto

Energy saving & cost reduction through the use of 10 - 14 bar steam from turbine extraction for sootblowing
Danny Tandra, Clyde Bergman Power Group

Online recovery boiler reduction degree and dissolving tank TTA data review
Jeff Butler, Valmet

SESSION 2B
LIME KILN OPERATION
Session Chairman: Niklas Berglin

Impact of co-firing biofuels and fossil fuels on lime kiln operation
Richard Manning, Kiln Flame Systems

Bio-dust burning in lime kiln
Mika Kottila, Andritz Oy

Stable lime kiln feed through on-line measurements and feed control
Lars Wallbäcks, Innventia

Advanced control of lime kiln
Sava Kovac, Andritz Oy

19:00 – 20:30 — *WELCOME RECEPTION*
Tampere City Hall

PROGRAMME TUESDAY JUNE 10, 2014

08:00-> Registration open (1st floor)

09:00 – 17:00 Exhibition (2nd Floor)

08:00 – 10:00

SESSION 3A
RECOVERY BOILER SAFETY
Session Chairman: Reyhaneh Shenassa

Understanding heavy smelt runoff from recovery boilers
Honghi Tran, University of Toronto

Use of Multi-Variant analysis to understand the root causes of premature smelt spout failures on recovery boilers
Jeff Wagoner, International Paper

Experimental studies on smelt shattering and dissolution in recovery boiler dissolving tanks
Markus Bussmann, University of Toronto

SESSION 3B
EVAPORATORS / CHEMICALS IN PULP MILL
Session Chairman: Chris Verrill

Modeling and evaluation of evaporator cleaming strategies
Erik Karlsson, Chalmers University of Technology

Minimizing evaporator energy consumption
Jarmo Kaila, Andritz Oy

New source of caustic for kraft mills from the electrolysis of sodium salts - preliminary economics
Jean-Noel Cloutier, Quebec Hydro

10:00- 10:30 ***Coffee Break + Exhibition (2nd Floor)***

10:30 – 12:00

SESSION 4A
RECOVERY BOILER - GUNS
Session Chairman: Pasi Miikkulainen

New design principles of flashing black liquor guns – Modeling and experiments
Mika Järvinen, Aalto University

Application of ultrasound velocity profiling for measuring flow behavior inside black liquor nozzles
Sanna Haavisto, VTT Technical Research Centre of Finland

PIV velocity field measurement for black liquor sprays
Ari Kankkunen, Aalto University

SESSION 4B
LIQUOR CYCLE / PULP MILL
Session Chairman: Maria Björk

Scaling of manganese in kraft pulping process
Marta Bialik, Innventia AB

Equipment performance analysis of a Canadian kraft mill: energy, water and chemical utilization improvement
Radia Ammara, Polytechnique Montreal

Advanced online process analyzers for chemical recovery and pulp mill control
Thanh Trung, Fitnir

12:00- 13:00 ***Lunch + Exhibition (2nd Floor)***

13:00 – 14:30

SESSION 5A
LIQUOR COMBUSTION AND CHEMISTRY
Session Chairman: Danny Tandra

Combustion behaviours of spent pulping liquors
Liming Zhao, University of Toronto

Combustion properties of reduced lignin black liquors
Niklas K.T Väha-Savo, Åbo Akademi University

Regression analysis of eucalyptus black liquor properties for prediction of sodium sulfate content
Melissa Tatiana Andreuccetti, University of Campinas

SESSION 5B
RECOVERY CYCLY MODELING
Session Chairman: Rikard Gebart

Computer modeling as a tool to estimate the impact of fuel type on the performance of kilns used to regenerate lime in the kraft process
Peter Gorog, Houston Cascade

Black liquor falling film evaporation: Computational model and pilot experiments
Aaron Howell, IPST at Georgia Institute of Technology

Flow dispersion in green liquor clarifier: CFD Modeling Review
Moise Dion, Daishowa Marubeni International Ltd

14:30- 15:00 — ***Coffee Break + Exhibition (2nd Floor)***

15:00 – 17:00

SESSION 6A
FUME CHEMISTRY / ESP / ASH TREATMENT
Session Chairman: Jarmo Kaila

Purification of recovery boiler ash
Johan Martin Wimby, Valmet

Development and testing of an aerosol test reactor to study gas-particle equilibrium
Fanni Mylläri, Tampere University of Technology

Effect of black liquor firing conditions on salt cake properties and precipitator performance
Inga-Lill Samuelsson, Alstom Power Sweden AB

Optimal electrical energization of ESP's for soda recovery boilers
Jacob Bendix, FLSmidth A/S

SESSION 6B
RECOVERY BOILER MODELING
Session Chairman: Esa Vakkilainen

Effect of flue gas temperature on gas-particle equilibrium in recovery boilers - a modeling approach
Aino Leppänen, Tampere University of Technology

Predicting sodium release in recovery boilers in conjunction with CFD furnace modelling
Perttu Jukola, VTT Technical Research Centre of Finland

Deposit formation in kraft recovery boilers
Manuel Garcia Perez, Lappeenranta University of Technology

Dimensioning a recovery boiler furnace using mathematical optimization
Viljami Maakala, Andritz Oy

PROGRAMME WEDNESDAY JUNE 11, 2014

08:00-> Registration open (1st floor)

09:00 – 17:00 Exhibition (2nd Floor)

FRBC 50 YEARS SEMINAR, SESSION 1
(Small Auditorium, 2nd floor)

08:30 – 10:00 OPENING SESSION
Session Chairman: Timo Merikallio

Opening Words
Timo Merikallio, Chairman of the Finnish Recovery Boiler Committee

Recovery boiler research highlights – 10 steps forward
Mikko Hupa, Åbo Akademi University

Recovery boiler history and future
Esa Vakkilainen, Lappeenranta University of Technology

10:00 - 10:30 Coffee Break + Exhibition (2nd Floor)

FRBC 50 YEARS SEMINAR, SESSION 2
(Small Auditorium, 2nd floor)

10:30 – 12:00 RECOVERY BOILER DEVELOPMENT
Session Chairman: Esa Vakkilainen

Review of black liquor spraying
Ari Kankkunen, Aalto University

Review of recovery boiler sootblowing
Honghi Tran, University of Toronto

12:00 - 13:00 Lunch + Exhibition (2nd Floor)

FRBC 50 YEARS SEMINAR, SESSION 3
(Small Auditorium, 2nd floor)

13:00 – 14:30 STATUS OF RECOVERY BOILERS
Session Chairman: Timo-Pekka Veijonen

Utilization of process data in recovery boilers
Song Won Park, University of São Paulo

XXL recovery boilers
Kari Haaga, Valmet

Review of high energy recovery boilers
Marja Heinola, Andritz Oy

14:30 - 15:00 Coffee Break + Exhibition (2nd Floor)

FRBC 50 YEARS SEMINAR, SESSION 4
(Small Auditorium, 2nd floor)

15:00 – 16:30 INTERNATIONAL RECOVERY BOILERS
Session Chairman: Honghi Tran

CFD modeling of kraft recovery boilers - a retrospective
Andy Jones, International Paper

Review of the black liquor gasification activities
Rikard Gebart, Luleå University of Technology

Reports from around the world
TBA

19:00 - 22:00 FINNISH RECOVERY BOILER COMMITTEE
50th ANNIVERSARY AND ICRC 2014 DINNER

PROGRAMME THURSDAY JUNE 12, 2014

08:00-> Registration open (1st floor)

09:00 – 17:00 Exhibition (2nd Floor)

08:00 – 10:00

SESSION 7A
RECOVERY BOILER MATERIAL & CORROSION 1
Session Chairman: Doug Singbeil

Influence of deposit aging on superheater corrosion
Daniel Lindberg, Åbo Akademi University

The influence of recovery boiler ash CO3/SO4 ratio on high temperature corrosion
Hanna Kinnunen, Valmet

Recovery boiler superheater corrosion - the solubility of protective metal oxides in a molten salts
Preet M. Singh, Georgia Institute of Technology

SESSION 7B
NITROGEN CHEMISTRY / NOX EMISSION
Session Chairman: Patrik Yrjas

The fate of char N in black liquor combustion - cyanate formation and decomposition
Nikolai A. DeMartini, Åbo Akademi University

Counter - current flows in the recovery-boiler lower furnace – a key to understanding nitrogen chemistry and sulphur capture
Paterson McKeough, Andritz Oy

Understanding the formation of NOx in pulp mill boilers
Markus Engblom, Åbo Akademi University

10:00 – 10:30 ***Coffee Break + Exhibition (2nd Floor)***

10:30 – 12:00

SESSION 8A
RECOVERY BOILER MATERIAL & CORROSION 2
Session Chairman: Timo-Pekka Veijonen

Flow induced accelerated corrosion in heavy black liquors
Preet M. Singh, Georgia Institute of Technology

Sulfuric acid induced low temperature corrosion in recovery boilers
Emil Vainio, Åbo Akademi University

Resistant composite tube products for black liquor recovery boilers
Urban Forsberg, Sandvik Materials Technology

SESSION 8B
EMISSION, LIQUOR Na/S BALANCE
Session Chairman: Sebastian Kankkonen

Industrial emissions directive & best available techniques reference document (BREF): Changing European legislation for recovery boilers
Jori Ringman-Beck, CEPI

Outstanding in-situ measurement technique - emission measurement without sampling
Kari Karhula, SICK OY

Black liquor a manmade fuel 5
Rolf Ryham, APPA Consulting

12:00- 13:00 ***Lunch + Exhibition (2nd Floor)***

13:00 – 14:30

SESSION 9A
BIOENERGY / BIOCHEMICALS 1
Session Chairman: Hans Theliander

Alternative heating oil from wood residues – industrial demonstration
Lauri Kokko, Valmet

Selection of structural materials for thermochemical processing of biomass
James Keiser, Oak Ridge National Laboratory

Catalytic hydrothermal conversion of LignoBoost Kraft lignin for the production of bio-oil and aromatic chemicals
Marco Maschietti, Chalmers University of Technology

SESSION 9B
BLACK LIQUOR ALTERNATIVE PROCESSES
Session Chairman: Timothy Hicks

Effect of process operating conditions on the electrodialysis treatment of kraft black liquor with bipolar membrane
Maryam Haddad, Ecole Polytechnique de Montreal

Acid precipitation of lignin from black liquor – Extraction limits and effects on chemical recovery
Miyuru Kannangara, Polytechnique Montreal

Reduction of carbonate formation during pyrolysis of borate doped black liquors
Rishabh Sarna, Åbo Akademi University

14:30 – 15:00 *Coffee Break + Exhibition (2nd Floor)*

15:00 – 16:30

SESSION 10A
BIOENERGY/BIOCHEMICALS 2/ALTERNATIVE PULPING LIQUOR
Session Chairman: Afonso Pereira

Oxidation of Soda-AQ black liquor into value-added chemicals
Jamie St Pierre, University of Maine

Hydroxy acids as potential kraft pulping by-products - comparison of different isolation methods
Klaus Niemelä, VTT Technical Research Centre of Finland

The MOXY polysulfide process
Harri Rautapää, Andritz Oy

SESSION 10B
WATER TREATMENT / WASTE WATER MANAGEMENT
Session Chairman: Peter Ryder

Water treatment challenges and solutions in modern recovery boilers
Timo Karjunen, Varo Teollisuuspalvelut Oy

Recovery of energy and chemicals from BCTMP waste water
Lauri Afflect, Rinheat Oy

Electrolytic conversion of sodium salts in a kraft mill
Jean-Noel Cloutier, Quebec Hydro

EXCURSIONS FRIDAY JUNE 13, 2014

UPM-KYMMENE KYMI MILL AND VERLA GROUNDWOOD AND BOARD MILL

Note! Booking for the excursion should be done via conference registration form.

Price:
The excursion registration fee per person is 100 €, student 50 €.
The registration fee includes charter bus transportation, lunch and refreshments during breaks.

Participants:
Minimum 20, maximum 40 person

Tentative programme:

08:00 - 08:30	Participant pickup
08:30 - 11:00	Charter bus Tampere – UPM-Kymmene Kymi mill
11:00 - 11:45	Lunch at the mill
11:45 - 12:15	Presentation of UPM-Kymmene Kymi Mill
12:15 - 14:15	Mill tour at UPM-Kymmene Kymi
14:15 - 14:45	Charter bus Kymi mill – Verla Groundwood and Board Mill
14:45 - 15:15	Refreshments at Verla Mill Cafe
15:15 - 16:15	Mill tour at Verla Mill
16:15 - 16:30	Break
16:30 - 18:30	Charter bus Verla Mill – Helsinki-Vantaa Airport
18:30 - 19:00	Charter bus Helsinki-Vantaa Airport – Helsinki City

METSÄ FIBRE RAUMA MILL AND OLD RAUMA CITY

Note! Booking for the excursion should be done via conference registration form.

Price:
The excursion registration fee per person is 100 €, student 50 €.
The registration fee includes charter bus transportation, lunch and refreshments during breaks.

Participants:
Minimum 20, maximum 40 person

Tentative programme:

08:00 - 08:30	Participant pickup
08:30 - 10:30	Charter bus Tampere – Metsä Fibre Rauma mill
10:30 - 11:00	Presentation of Metsä Fibre Rauma mill
11:00 - 11:45	Lunch
11:45 - 13:45	Mill tour (recovery island) at Metsä Fibre Rauma mill
13:45 - 14:00	Charter bus Metsä Fibre Rauma mill – Old Rauma
14:00 - 16:00	Old Rauma tour and refreshments
16:00 - 19:00	Charter bus Old Rauma – Helsinki-Vantaa Airport
19:00 - 19:30	Charter bus Helsinki-Vantaa Airport – Helsinki City

SOCIAL PROGRAMME

Sunday, June 8, time 17:00-20:00
Get Together Event, Speakers Briefing at Tampere Hall
Yliopistonkatu 55, 33100 Tampere, Finland

Monday, June 9, time 18:00-19:30
Welcome reception at Tampere City Hall
Tampere Central Square 10, 33210 Tampere, Finland

Celebrate with us! Wednesday, June 11, time 19:00-23:30
FRBC 50th Anniversary and ICRC 2014 Dinner at Tampere Hall
(Park Hall = Sorsapuistosali), Yliopistonkatu 55, 33100 Tampere, Finland

The Finnish Recovery Boiler Committee has promoted safe, economic and environmentally friendly operation of recovery boilers and closely related processes since 1964. So the year 2014 marks the 50th year of recovery boiler cooperation in Finland. FRBC celebrates this occasion arranging a special anniversary dinner. All conference participants are warmly welcome to enjoy this FRBC 50th Anniversary and IRCR 2014 joint dinner.
Note! Ticket for the dinner may be purchased ahead of time for EUR 80.

During the conference, spouses and guests can enjoy a special programme (must register and pay fee to participate), which includes:
- Get Together Event on 8th June
- Welcome reception at Tampere City Hall on 9th June
- Guided city tours
- Cruise on lake Pyhäjärvi

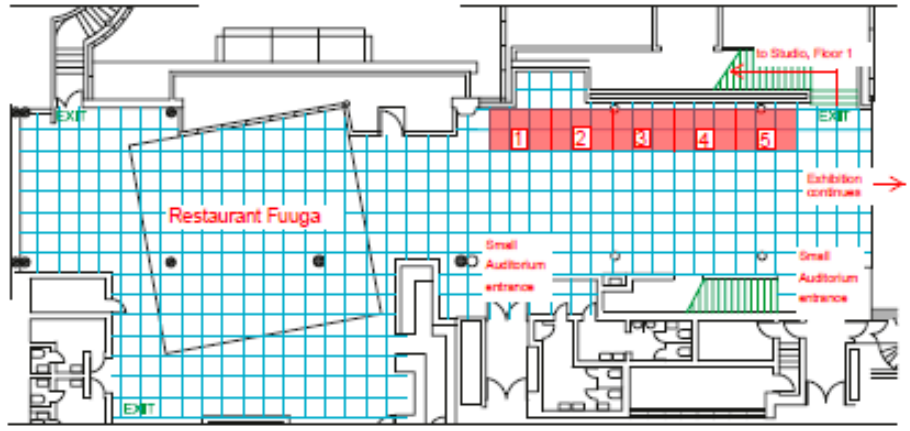
Visa-free cruise to St. Petersburg from Helsinki June 13, 2014!
Explore a true metropolitan city and travel visa-free to St. Petersburg with St. Peter Line. Enjoy delicious meals onboard and see a stunning show performed by intrenational and russian entertainers.

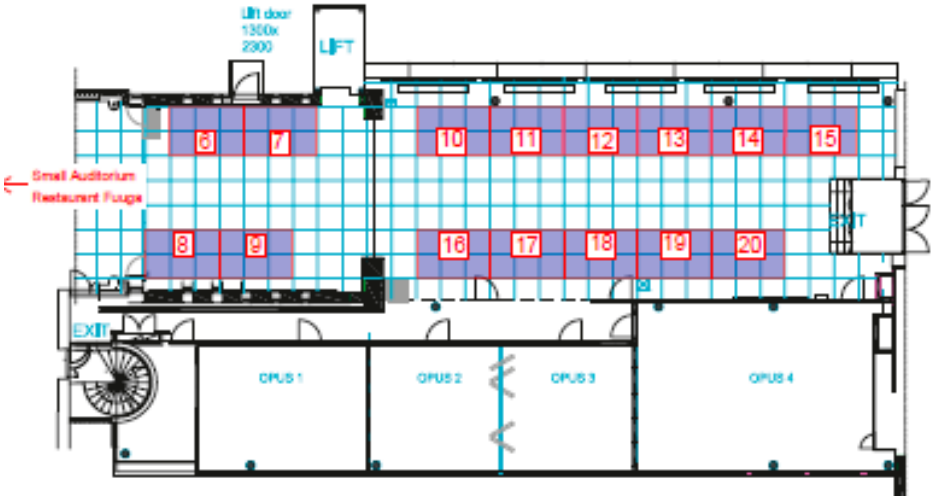
Interested?
Please contact Nordic Ferry Center for more information and bookings.
Address: Pieni Roobertinkatu 13 B (2. floor), 00130 Helsinki
Phone: +358 9 2510 200
Email: info@nfc.fi
Internet: www.ferrycenter.fi

EXHIBITION

The exhibition is located in a dedicated area on 2nd floor (Park Foyer 2) next to the small auditorium.

The exhibition is open from Monday 9 June to Thursday 12 June 9:00-17:00.





HOTEL AND TRAVEL INFORMATION

The conference organisers have booked room quotas in the following four hotels. They are all situated in the Tampere City centre, within an easy walking distance of the Tampere Hall.

Everyone is expected to book own accommodation at the hotel desired via conference registration form. When reservation is done via the registration form the special prices are valid and the availability can be guaranteed.

Sokos Hotel Villa
Sumeliuksenkatu 14, 33100 Tampere, Finland
Distance to the Tampere Hall 300 m.

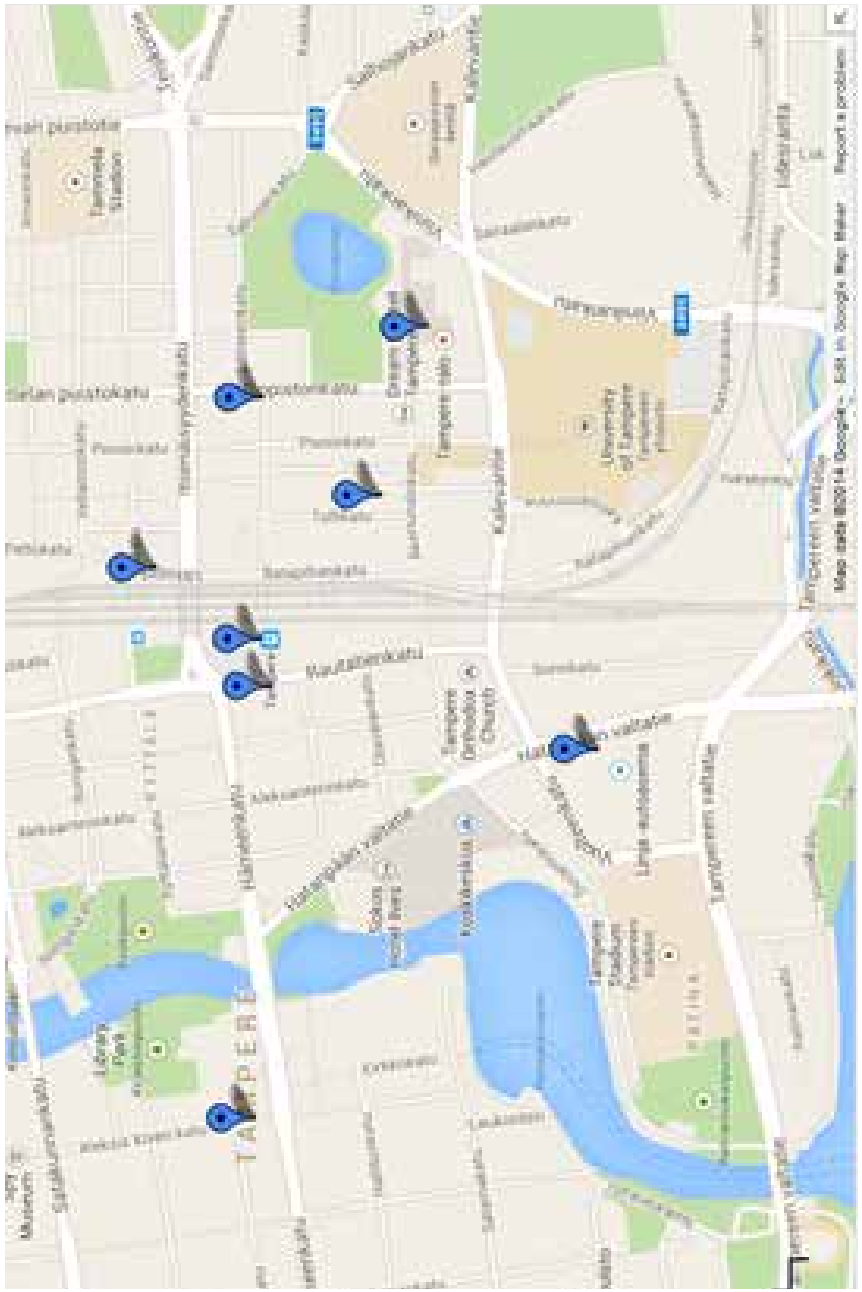
Holiday inn Tampere
Yliopistonkatu 44, 33100 Tampere, Finland
Distance to the Tampere Hall 200 m.

Scandic Tampere Station
Ratapihankatu 37, 33100 Tampere, Finland
Distance to the Tampere Hall 600 m.

Scandic Tampere City
Hämeenkatu 1, 33100 Tampere, Finland
Distance to the Tampere Hall 1 km.

Visit Tampere Tourist Information
Tel +358 3 5656 6800
Railway station, Rautatienkatu 25 A
33100 Tampere, Finland
visittampere@visittampere.fi
www.visittampere.fi

TAMPERE MAP



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