

Consortium Materials technology for thermal energy processes – minutes board meeting no 2/18

Date	May 16, meeting time 09.00-11.30	
Place	Telephone meeting	
Participants	Erik Skog (chair) Anna Jonasson Johan Hernblom Thomas Helander Bosse Jönsson Matti Huhtakangas Erik Dahlén Kyosti Vanska Annika Stålenheim Pamela Henderson Helena Oskarsson Andreas Borg Lars Mikkelsen Rikard Norling Johan Moverare Jan-Erik Svensson Bertil Wahlund (secre.)	Erik Skog AB E.ON Energilösningar Sandvik Materials Technology Sandvik Heating Technology/Kanthal Sandvik Heating Technology/Kanthal MH Engineering Stockholm Exergi Sumitomo SHI FW (SFW) Vattenfall Vattenfall Siemens (from item 6.6) GKN Aerospace B&W Vølund Swerea KIMAB Linköpings universitet Chalmers Energiforsk
Prevented	Vesna Barišić Dilip Chandrasekaran Jesper Ederth Søren Aakjær Jensen Marie-Aude Porter Jukka Meskanen Thomas Norman Christoph Gruber Sebastian Kaiser	Sumitomo SHI FW (SFW) Kanthal/Sandvik Heating Technology Sandvik Materials Technology Ørsted Siemens Fortum B&W Vølund Andritz Andritz
Distribution	participants, prevented and	
	Sven Andersson Per Kallner Andreas Sundlöf Erik Westman Heike Martinsson Henrik Lindståhl Mikael Fransson Ulf Hagman Erika Antonsson Toni Holkko Lucas Enström Ulf Lindqvist Dag Wiklund Jesper Baaring Johan Thelander Magnus Eriksson Per Tunberg Patrik Schneider Jasmin Aspen Erik Thornström	B&W Vølund/Götaverken Vattenfall Söderenergi Söderenergi Söderenergi Tekniska verken i Linköping AB Tekniska verken i Linköping AB Göteborg Energi AB Göteborg Energi AB Gävle Energi Gävle Energi Jämtkraft AB Jämtkraft AB Öresundskraft Karlstads Energi AB Mälarenergi AB Mälarenergi AB Kraftringen Kraftringen Swedenergy

1 Agenda

The distributed agenda was approved.

2 Person to approve minutes

JH Sandvik MT was elected to approve minutes (next present person/company on participants list).

3 Minutes from board meeting 1/18

The minutes from board meeting 1/18 was approved without comments.

4 Notifications

4.1 Coming dissertations

Upcoming dissertations

- Patrik Alnegren, HTC, June 12, on Fuel cells
- Andrea Olivas, KME/HTC, during autumn date not set

Recently defended dissertations

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4.2 Coming conferences and workshops

The 27th International Conference on the Impact of Fuel Quality on Power Production and the Environment, September 24–28, 2018, Lake Louise, Canada. <http://blogs2.abo.fi/fuelqualityimpact/>

High Temperature Corrosion under Complex Conditions, Deposits, and Salts: Towards Greener Energy, September 26-29 2018, Dechema, Frankfurt, Germany.

5 Budget

BW showed the updated budget follow. Follow up is made of funds used, requested cash and reported in-kind. The reporting follows the plan in most cases and several of projects reports in-kind contribution over 100 % or very near. Updated budget in annex 1.

Any remaining in-kind contribution for work up to April 15 should be reported ASAP (except for KME-706 and KME-719 that are ongoing to June 30).

In the following projects low industry in-kind contributions are identified:

- KME-713, *Durable MCrAlX Coatings for demanding applications in gasturbines* extension of KME-703. Question put to project and industry part Siemens. Low industry in-kind contribution is assumed to only be due to late reporting.
- KME-720, *The effect of increased fractions of waste wood on water wall- and superheater corrosion*, low industry in-kind contribution due to the previously reported incident with a water wall probe. Latest statement shows that costs on Chalmers is more or less matched by industry in-kind contribution, but the final figures are not in place yet. In KME-711, the industry contribution might be over 100 %. BW and JES/project may ask SEA if they can approve that industry contribution from KME-711 is instead accounted for in project KME-720, as closely related project and same combined project report.

6 Approval of final project reports

Evaluation and approval of final project reports.

6.1 KME-701, Influence of high-temperature environments on the mechanical behaviours of high-temperature austenitic stainless steels

Project leader: Mattias Calmunger, LiU

Industry partners: Sandvik MT, Kanthal

Comments

- High quality work in project.
- Reference group has questioned the comprehensiveness of the first versions of report. It is now adjusted, and the report is approved by reference group.
- Content of the report is fine. However, the report is a bit fragmented and text needs to be re-arranged and revised. Adjustments and rephrasing is needed to help the reading. It is for example difficult to get an overview of the experiments in the beginning and writing as "this paper" at p 21, 25, 28 should be rephrased.
- Elaborate section *1.5 Project organisation*; should be complemented with project budget and engaged PhD students.
- Creep and fatigue diagram, as an important part of the project, should be included in report.
- Keywords is lacking in summary and should be added.
- The conclusions should be complemented with comments on how the results could be used by the industry stakeholders.
- Detailed comments from PH/Vattenfall, to be forwarded to project leader, will be sent to BW.

Decision

- BW, PH and RN is delegated the task to evaluate and approve the revised version of report
- Report approved when the above comments are attended to.
- Notification to board when the revised report is approved

6.2 KME-702, LCF and TMF crack growth in cast nickel-based superalloys

Project leader: Johan Moverare, LiU

Industry partner: Siemens IT

Comments

- Nice and clear report.
- Make sure that definition of K is clearly included report; when the factor is introduced.

Decision

- Report approved when the above comments are attended to.

6.3 KME-703/713, Durable MCrAlX Coatings for demanding applications in gasturbines

Project leader: Ru Peng, Linköping university

Industry partner: Siemens IT

Comments

- Clear and well explained report
- Define abbreviations, such as IBDZ, BLZ and OBDZ in fig 1 and TGO in fig 2.
- Keywords is lacking in summary and should be added.

Decision

- Report approved when the above comments are attended to.

6.4 KME-705, MoSi₂ matrix composites for combustion components exposed to high temperature oxidation and hot corrosion

Project leader: Yiming Yao, Chalmers

Industry partner: Kanthal

Comments

- Future work should be general and not focusing on KME.
- Clarify budget in project organisation.
- The abstract is very technical and should be revised and written more general. The revised abstract can be used as back side-text.

Decision

- Report approved when the above comments are attended to.

6.5 KME-707, Improved Steam Turbine Design for Optimum Efficiency and Reduced Cost of Ownership

Project leader: Magnus Genrup, Lund university

Industry partner: Siemens IT

Comments

- Keywords is lacking in summary and should be added.
- Section *1.5 Project organisation* should be complemented with project budget.
- The text "The work has revealed that, despite the SST-700 and -900 are mature products, there are room for improvement" in Goal fulfilment should also be included in the conclusions.

Decision

- Report approved when the above comments are attended to.

6.6 KME-709, Increased steam temperature in grate fired boilers – Steamboost

Project leader: Torbjörn Jonsson, Chalmers, HTC

Industry partners: B&W Völund, Kanthal, Sandvik MT and Göteborg energi

Comments

- Work very good
- General improvement of the report is needed. For example, the language, especially the Swedish sammanfattning, and figures with poor quality (fig 8 for example) needs to be controlled and revised.
- Specific comments on the summary
 - o revision of language, both Swedish and English.
 - o what has been done, project organisation and news value should be explained.
 - o "key components" is mentioned, but it is not clear which the key components are.
 - o keywords are lacking and should be added.
- The abstract should be rephrased. It should be possible to understand the abstract without reading report.
- A section *1.5 Project organisation* needs to be added. The section should include engaged PhD students, participating companies, budget (contribution from resp industry partner), etc.
- The conclusions should be complemented with general conclusions and comments on how the results could be used by the industry stakeholders.
- The goal fulfilment needs to be elaborated (describe each goal, and then the fulfilment of the goals)
- The back side-text should include general results.

Decision

- The board request an updated and revised report with the above comments attended to.
- Approval of report is postponed to next meeting.

6.7 KME-710, Design of a new generation of 12% chromium steels

Project leader: Fang Liu, Chalmers

Industry partner: Siemens IT

Comments

- Very good work performed and nice report.
- Information about the effect of Molybdenum should be included in report
- Conclusions very detailed and technical, but not general conclusions. Review the conclusion and make more general. Conclusion should also include the benefits (usefulness) for industry.
- A less technical and detailed Abstract, completed with useful results, could be used as back side-text.

Decision

- Report approved when the above comments are attended to. PH assist BW in the evaluation and approval.

6.8 KME-711, Combating superheater corrosion by new materials and testing procedures - Corrosion exposures in the waste fired CFB boiler P15 at Händelö (combined report with KME-720, item 6.13 below)

Project leader: Jesper Liske, Chalmers, HTC

Industry partners: E.ON, Sumitomo, Kanthal, Sandvik MT, MH Engineering, Stockholm Exergi, and Mälarenergi, Göteborg energi, Söderenergi

Comments

- Very good work performed in the project
- Clarify that there are two different projects but one combined report, in summary, introduction and conclusions, and where relevant in report.
- Summary should be revised somewhat. For example, explain what has been done in project (what field tests) and the project organisation. A number of results are listed but called activities; rephrase. Keywords are lacking and should be added.
- Elaborate 1.5 Project organisation. The section should include engaged PhD students, budget (contribution from resp industry partner), etc.
- In the conclusion, it should be elaborated on how stakeholders and utilities can utilise the project results, for example how could the large matrix of results be used to optimise the material selection, what does "promising" results signify and could the HVAF and HVOF CorEr be used in boilers?
- The Abstract should be completed with useful results, and could then be used as back side-text.

Decision

- Report approved when the above comments are attended to.

6.9 KME-714, Sulfur recirculation and improved material selection for high temperature corrosion abatement – Investigating different aspects of corrosion memory

Project leader: Torbjörn Jonsson, Chalmers, HTC

Industry partners: B&W Völund, Götaverken Miljö, Ørsted, and Göteborg Energi

Comments

- Summary should be revised. For example, clarify the main (two) research tasks in project, what has been done and what field and lab tests, project organisation and comments on goal fulfilment. Keywords are lacking and should be added.
- Section *1.5 Project organisation* should be elaborated with staff, engaged PhD students, budget
- The term "received steel" should be defined.
- Elaborate Conclusions in terms of news value of project results and usefulness for industry and utilities; how the results could be utilised.

Decision

- Report approved when the above comments are attended to.

6.10 KME-715, Composite Metal Polymer (CMP) for non-stick improvements in CHP plants

Project leader: Rikard Norling, Swerea KIMAB/Matti Hutakangas, MH Engineering

Industry partners: MH Engineering, Ørsted, Öresundskraft

Comments

- The report easy to read and understand.
- Late results with high news value about non-stick properties and the benefits with CMP, such as reduced cleaning time and costs, etc should be included in the report. As these results arised after project conclusion, it could be reported as an appendix. However, the new results should be included in the conclusions.
- Page number is lacking
- Add project budget to section 1.5 Project organisation
- Conclusions:
 - o clarify and elaborate the implications of "... not much deposit formed in the exposure areas" and "No top coating could be detected by SEM/EDS on the samples exposed in the superheater areas position..."
 - o Would it be possible to draw general conclusions about the usefulness of CMP?
 - o Add new and late results in the conclusions

Decision

- Report approved when the above comments are attended to.

6.11 KME-717, Boiler corrosion at lower temperatures – influence of lead, zink and chlorides

Project leader: Rikard Norling, Swerea KIMAB

Industry partners: Vattenfall, Andritz, Stockholm Exergi

Comments

- Clear and good report
- Consider rephrasing the general project conclusions, regarding sulphur containing additive, which ChlorOut is an example of.
- How ChlorOut is used in plant should be clarified.
- Back side-text is needed. Abstract, with highlighted news values, can be used.

Decision

- Report approved when the above comments are attended to.

6.12 KME-718, High temperature corrosion in used-wood fired boilers – fuel additives and coatings

Project leader: Rikard Norling, Swerea KIMAB

Industry partners: Sumitomo, Andritz, E.ON, Stockholm Exergi, MH Engineering, Sandvik Heating Technology, Sandvik Materials Technology, Vattenfall AB

Comments

- Very good project and report.
- Rephrase "belägningsprojektet" in Swedish summary to "beläggningstesterna" or similar.
- Highlight news value further in conclusions, such as the use of sludges opens up for more fuel flexibility (already written in report in *4 Analysis of the results*)
- Back side-text is needed. Abstract, with highlighted news values, can be used.

Decision

- Report approved when the above comments are attended to.

6.13 KME-720, The effect of increased fractions of waste wood on water wall- and superheater corrosion - Combating corrosion by new materials and improved material selection (combined report with KME-711, item 6.8 above)

Project leader: Jesper Liske, Chalmers, HTC

Industry partners: Kanthal, Sandvik MT, Sumitomo, MH Engineering, and Kraftringen

This project is dealt with under item 6.8.

6.14 Remaining projects

Remaining projects, concluded 2018-06-30, will be evaluated and approved, together with a revised report KME-709, at next meeting after summer holidays. Remaining and ongoing projects:

- *KME-706, Weldability of nickel-base superalloys for energy applications*
Project leader: Lars Nyborg, Chalmers
Industry partner: GKN Aerospace
- *KME-719, Development of weldability assessment and understanding of hot cracking in boiler and gas turbine materials*
Project leader: Lars Nyborg, Chalmers
Industry partner: GKN Aerospace.

7 Programme conference HTC/KME

Feedback on the 2018 conference held March 20-21, 2018, at Spårvagnshallarna, Stockholm.

Comments:

- The poster session is very valuable as it catalyses good discussions. However, very few posters were presented. Projects should be further encouraged to present posters, or at least a picture from the oral presentations.

8 Others

A general comment on the project reports, the section *1.5 Project organisation* should be elaborated in many cases. The section should include engaged PhD students, participating companies etc and budgets, in order to describe the set-up and size of project.

9 Next meetings

2018 meetings. Doodle polls will be distributed to set the dates:

- Additional meeting for finalising the programme period and approve the last three reports to be held after summer holidays.

New programme period

- Telephone meeting in June for summarising the prerequisites for the new period and the outcome for submitted project applications to SEA (decisions are due during May).
- Physical start-up meeting of new period is postponed to after summer holidays.

Minutes by

Bertil Wahlund

Minutes approval

Johan Hernblom, Sandvik MT

Minutes approval

Erik Skog, chairperson

Projects

Budget follow up, total costs

Programme budget [kSEK]	Programme and project financing				Funds used, kSEK				
	Total	SEA	%	Industrv	Cash SEA, req		Industry total		
					kSEK	%	In-kinds	cash	%
For projects	115 000	46 000	40,0%	69 000					
Programme management	8 950	3 800	42,5%	5 150					
Sum:	123 950	49 800	40,2%	74 150					
Decided projects									
KME-701 (39297-1)	7 180	2 872	40,0%	4 308	2224	77%	4124		96%
KME-702 (39279-1)	14 435	5 735	39,7%	8 700	5162	90%	8791		101%
KME-703 (39296-1)	5 447	2 167	39,8%	3 280	2167	100%	3280		100%
KME-705 (39298-1)	1 000	400	40,0%	600	351	88%	593		99%
KME-706 (39283-1)	12 500	5 000	40,0%	7 500	2873	57%	6828		91%
KME-707 (39281-1)	7 238	2 895	40,0%	4 343	2436	84%	3692		85%
KME-708 (39270-1)	7 383	2 963	40,1%	4 420	2963	100%	4849	15	110%
KME-709 (39287-1)	10 612	4 245	40,0%	6 367	3643	86%	5950	23	94%
KME-710 (39286-1)	2 000	800	40,0%	1 200	700	88%	1266		106%
KME-711 (39299-1)	12 460	4 984	40,0%	7 476	3928	79%	6923	627	101%
KME-713 (40038-1)	2 400	960	40,0%	1 440	828	86%	189		13%
KME-714 (40118-1)	7 590	3 036	40,0%	4 554	1932	64%	3570	76	80%
KME-715 (40040-1)	2 361	944	40,0%	1 417	518	55%	1398		99%
KME-717 (40892-1)	4 491	1 796	40,0%	2 695	1170	65%	2561		95%
KME-718 (41515-1)	2 633	1 053	40,0%	1 580	261	25%	1606		102%
KME-719 (40893-1)	9 102	3 500	38,5%	5 602	2451	70%	4780		85%
KME-720 (41048-1)	5 205	2 082	40,0%	3 123	658	32%	1302	152	47%
Programme management, tot	8 950	3 800	42,5%	5 150	3800	100%	5150		100%
Tot. for projects:	114 037	45 433	39,8%	68 605	Proj: 34264	75%	61702	####	91%
Remaining budget:	963	567	58,9%	396	Mgmt: 3 800		5150		
Share decided, %	99,2%	98,8%		99,4%					
Share remaining budget, %	0,8%	1,2%		0,6%					