



CCGEx

Competence Center Gas Exchange – KTH

Research Day & IAB visit
2015-11-12



CCGEx



Objective of the Research Day

- Gather all CCGEx partners
- View of CCGEx direction/ Research needs
- Common status update on research progress
- Provide a possibility for interaction, discussion and feedback
- IAB – External Review of CCGEx
 - Direction
 - Cooperation
 - Research quality / relevance





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Meeting Agenda

12-11-2015

Thursday 12th Nov

Part1: CCGEx research day

08:00- 08:15 Registration Sal: F3
Address: Lindstedtsvägen 26

08:15-08:30 Opening by CCGEx head – Anders Hultqvist Sal: F3

Turbomachinery-ICE interaction Research Area

08:30-09:30 Project: Compressor off design Operation Sal: F3
- Mihai Mihaescu: intro + overview (10+5 min) Sal: F3
- Three PhD project presentations (10+5 min each)
- Bertrand Kerres (Exp), KTH - ICE
- Elias Sundström (CFD), KTH - Mek
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Exhaust After-Treatment (EAT) Research Area

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- Project preliminary data presentation (10+5 min)

11:30- 12:45 Lunch & Poster Session
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Future Research Area: Gas Exchange Systems

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13:00- 13:15 Environment set-up for the afternoon Sal: F3
discussions
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13:30-14:15 IAB Interviews with the PhD students Sal: Hjärne
Address: Osquars backe 25

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faculty at CCGEx & Industrial partners
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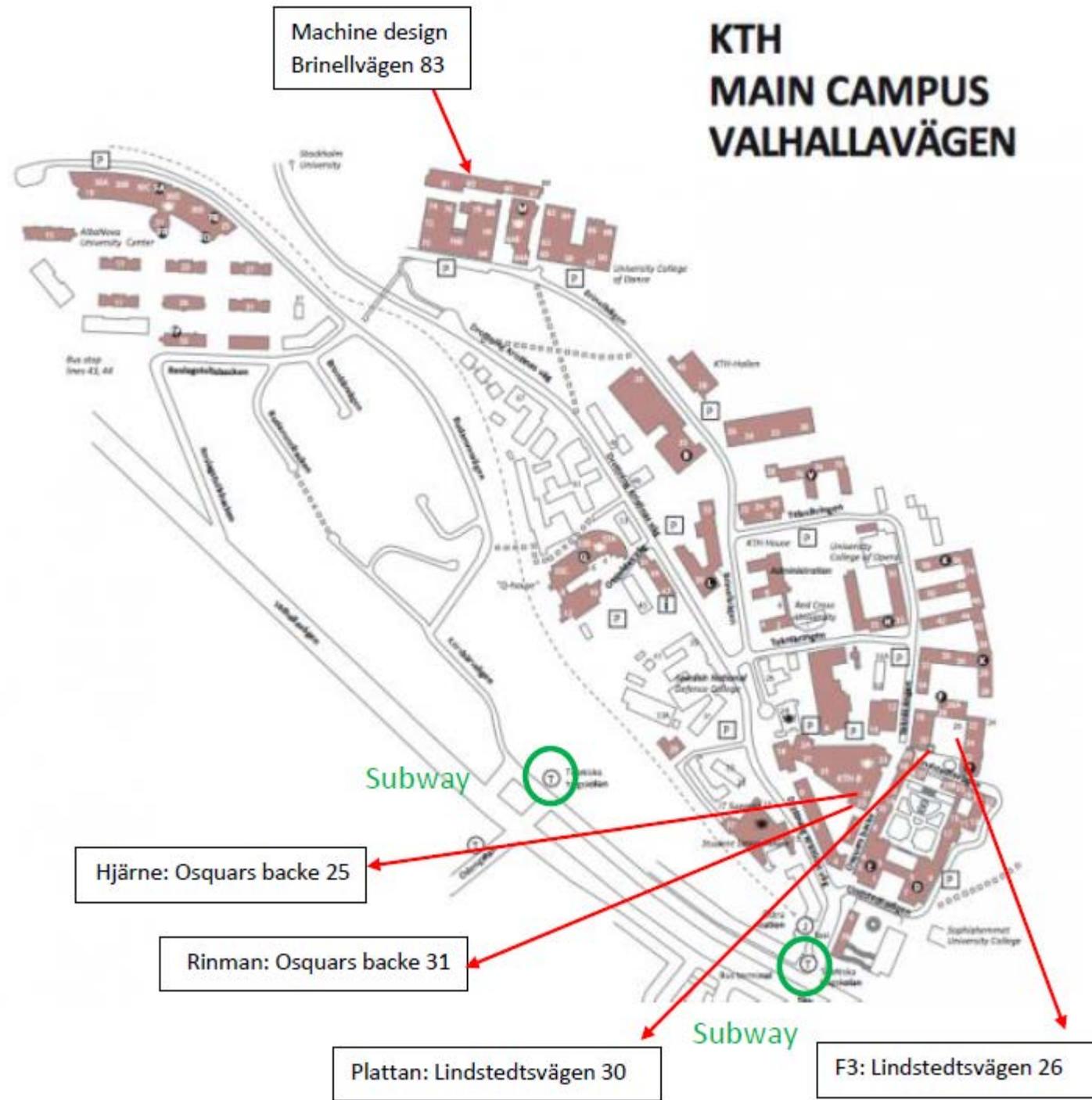
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Locations





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CCGEx Current Standing

Program period 2014-2017

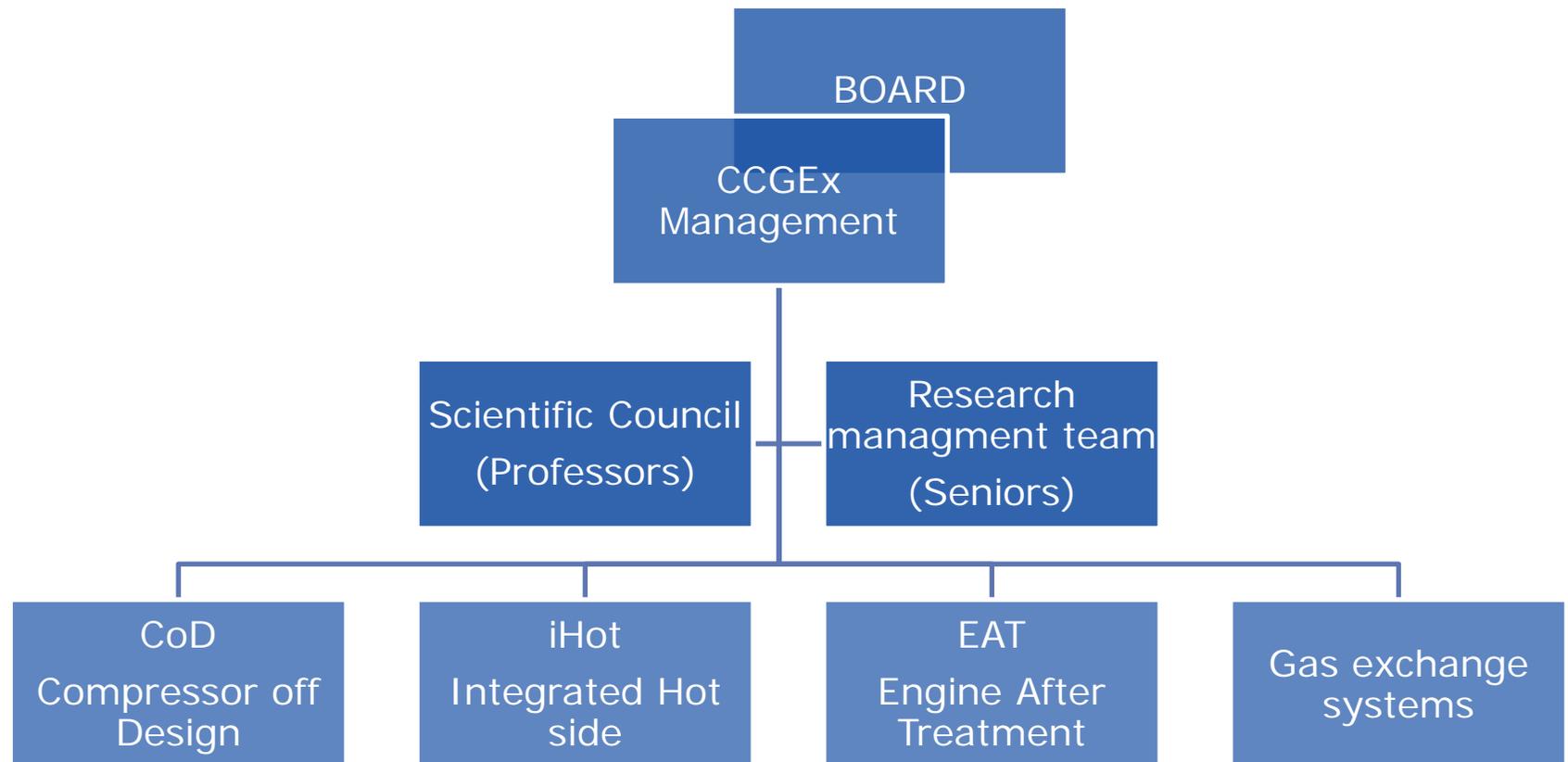
- Halfway – July 1st 2015 new director & organisation
- Good progress on research projects
- Fully staffed
- Funding and spending generally in place
- Some operational improvements implemented - a few more to come.
- Strategy due for review and preparations for next phase start mid 2016.



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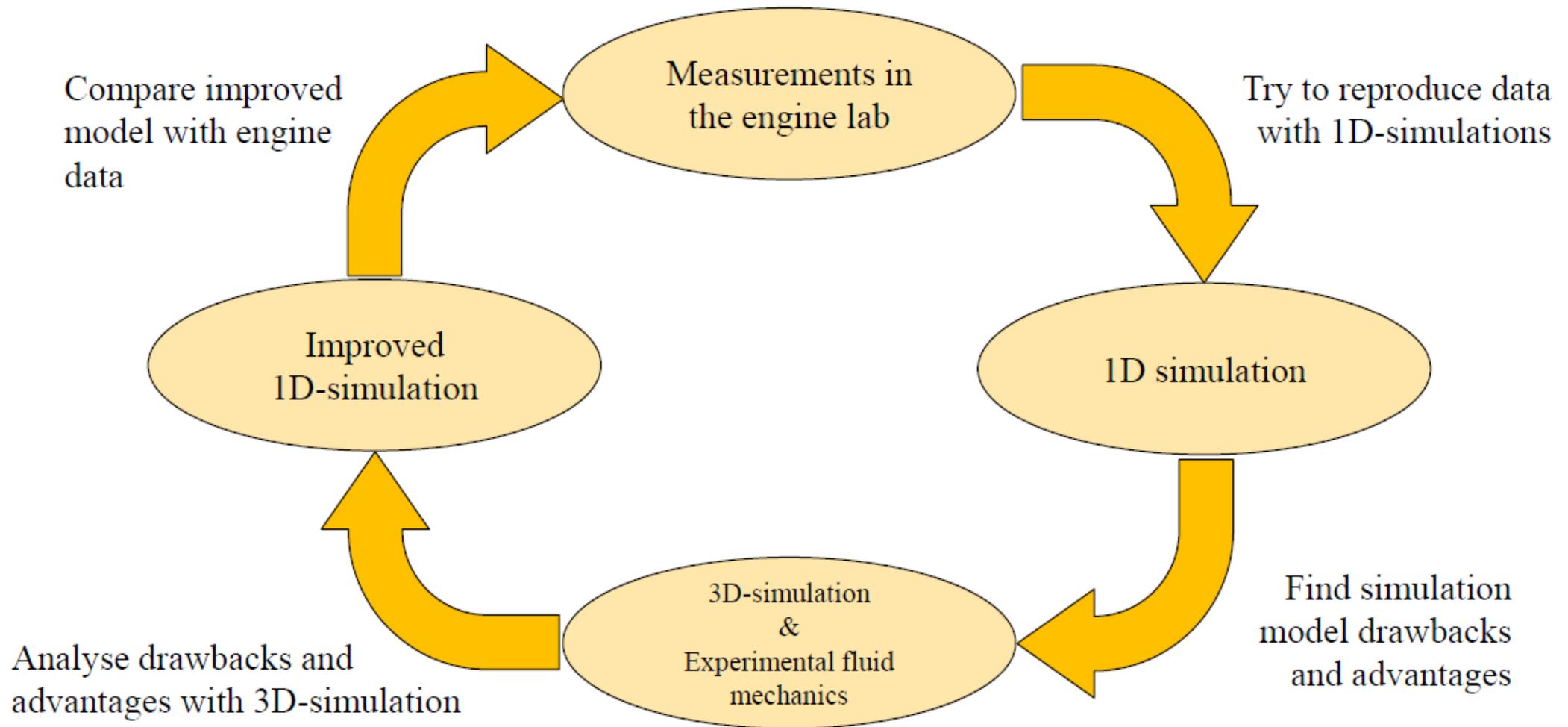
CCGEx – Organisation

July 1st 2015

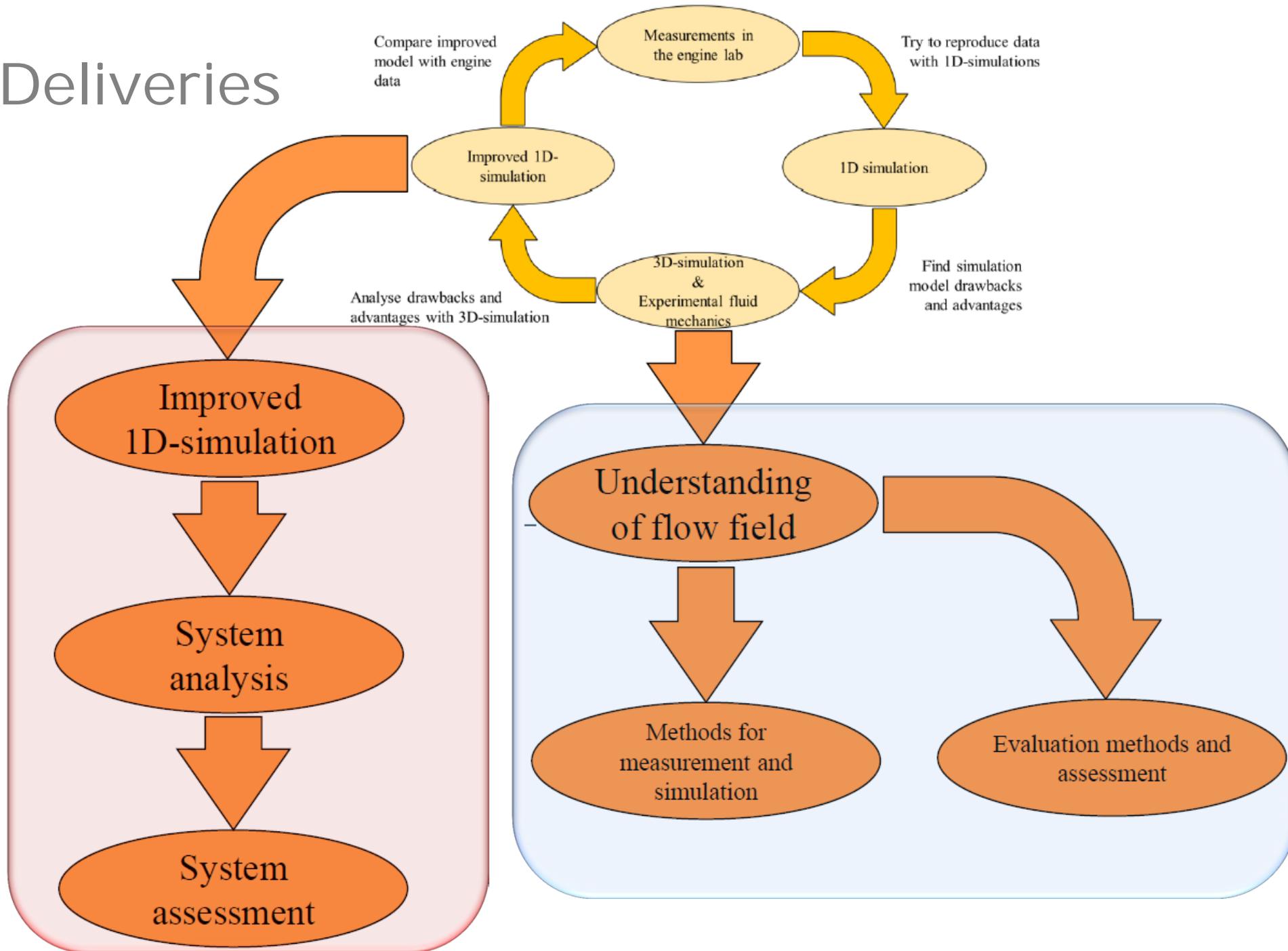


CCGEx Strategy

Close the loop between engine system/components and detailed flow and acoustics



Deliveries





CCGEx

Project Overview CCGEx Q3 2015

Projects vs area	2015				2016				2017				2018			
	Q1	Q2	Q3	Q4												
Cold Side																
CoD; senior researcher Mihai																
CoD - Bertrand Kerres, ICE																
CoD - Elias Sundström Fl.mek sim																
Volvo Cars ind.PhD - Flsim/exp																
Acoustic&Liners - MWL PostDoc Lin du																
Acoustic&Liners - MWL Marie Curie Raimo																
Incyylinder flow - FFIprojekt P.Doc Sissy																
Hot Side																
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Scania ind.dok - ICE turbo machinery - Nicholas Anton																
Turbo machinery / Pulsating flow - P.Doc C Ford Fl.mek exp																
EAT																
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EAT - akustik doktorand Ghulam																
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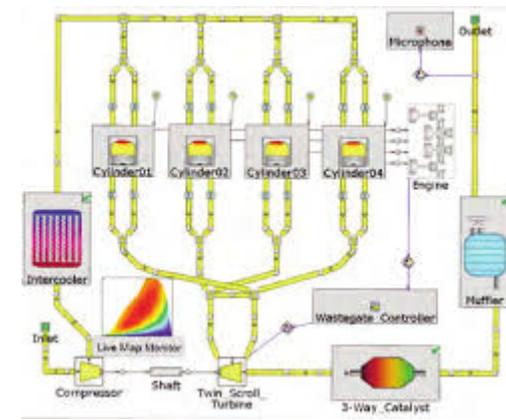
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Program Area Description

Gas Exchange Systems



- System perspective – close the loop between engine system/components and detailed flow and acoustics
- Mapping interest and requirements from industry
- Research new concepts and methods by system modeling and testing
- Use 1D system models to aggregate knowledge from 3D detailed component simulation and engine/rig measurements
- Deliver better 1D models and through them conceptual understanding/system assessments
- Deliver good boundary conditions for 3D simulations
- Connect component knowledge with system understanding





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Project Example 1

Assessment of Gas Exchange Systems for Effective & Clean HD Otto Engines

- Renewable fuels with very good otto properties – Ethanol(E85), Methanol, Bio Gas (Methane).
- Concept:
 - DISI, two stage T/C, miller timing, EGR, 3way cat
- Potential:
 - Emissions – Stoich, EGR and 3-way cat = ZERO
 - Efficiency – 12-16:1 CR, quick burn, Miller timing (VVT), 2–stage T/C , ETA > 45% at best point
 - Power Density – 30 bar bmep ?
 - Product cost – Cheaper than HD Diesel?
- Questions (Industry & Academic)
 - System configuration with non-conventional values
 - Knock limitations for BMEP and efficiency
 - Component temperature control
 - Optimal system layout for efficiency & power density



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Project Example 2

2-stage DEP

- Concept:
 - Two separate exhaust ports
 - "blow down" gases is routed to the HP turbine
 - the exhaust scavenging stroke into the LP turbine.
 - Exhaust from the HP turbine is routed into the LP turbine.
 - Combined with 2stage compressor, intercooler and unconventional timing.
- Potential
 - Very cold combustion
 - Very high gas exchange efficiency
- Questions
 - Is it possible? What is the potential?
 - What kind of valve events, compressors and turbins will be required?
 - Transients?



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Meeting Agenda Afternoon!

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PARALELL SESSIONS

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Previous recommendations 1 (3)

- The already on-going exchange between industry and academia should be improved. One possibility is the implementation of industrial supervisors.
 - N/A, but there are active industrial reference groups.
- Further enhance the link between experiment and simulation. The options for experimental work might have to be improved (e.g. pulsating turbine flow measurements on component test benches)
 - Available for CICERO LAB/ICE LAB
- Identify realistic research fields for PhDs within the range of exhaust gas after treatment (EAT).
 - Particulate characterization and grouping project formed. SCR spray under evaluation.
- Clarify chances to integrate other fields of research like the Miller/Atkinson processes.
 - New area under formation "Gas exchange systems" – funds to be seen.



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Previous recommendations 2 (3)

- Identify options to better integrate PhDs from KTH as well as from industry.
 - Forming common research areas
- Clarify the option of turbomachinery competence of KTH within CCGEx.
 - TBD seeding in process
- Further increase the exchange of information within CCGEx and other competence centres.
 - N/A Still remains to be tended to ... SICEC in coordination function but no exchange.
- Assess also the possibility to collaborate with international partners, eventually on the basis of EU funds.
 - New partners approached in turbomachinery, valve technology and heat exchangers. Will be extended.



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Previous recommendations 3 (3)

- Assess access control to general know-how of KTH and CCGEx by international students.
 - Under investigation
- Increase resources (mainly technicians) for the IC Engine Group. Assess if there is an option of paid graduate student positions to support research projects.
 - RA and TA employed still missing funds for lab manager. Several associated projects running.
- Check the options to better prepare students within study courses so that competences are available for the performance of bachelor theses.
 - No progress... yet.

Interviews and discussions

