CAPE-OPEN Survey

Preliminary findings on needs and usage of CAPE software tools
CAPE-OPEN Survey - Objectives

- Assess awareness/visibility of CAPE-OPEN and CO-LaN within the chemical engineering community
- Prioritise the work of CO-LaN and the future development of the CAPE-OPEN standard
- Identify interest and stimulate participation in SIGs
- Identify potential new CO-LaN members
CAPE-OPEN Survey - Status

- Distributed in June 2018 to all CO-LaN members with added request to forward the survey to end-users
- Difficulties encountered engaging major software vendors to forward survey link to their users
- This report is based on 76 responses from
  - CO-LaN managed mailing lists
  - COCO mailing list
  - The respondents appear to have an affinity to CAPE-OPEN

Survey remains open; we are looking for additional channels for distribution

Please help to distribute the survey
There is a significant opportunity for CO-LaN to follow up on potential new members and end-users.
The areas of simulation interest & interoperability experiences with process simulation tools
❖ Respondents exposed to range of PMEs & thermo packages*.
❖ Native library PMCs are predominantly used
❖ Interoperability of in-house UOs is important to the respondents

*Distribution not representative of the full market
Areas of interest: dynamic simulations

- Interest in dynamic simulation.
- Operation Training Systems not explicitly mentioned; i.e. is there limited interest in the dynamic unit operation specification? Is due to the sample?
Most respondents are interested in EO for modelling non-standard processes.

Is there limited interest in EO based optimizer or dynamic simulators?

### Academic studies of how a flowsheet process simulator works
- Advanced energy systems
- Complex kinetics
- In-house processes and tools
- Metalurgical processes, overall mass balances of biorefinery processes
- Biorefinery processes
- Implementing models of smaller unit operations / processes (Python)
- Multiple-phase reactors linked to complex kinetics
- New process development and scaling-up
- Production Optimisation
Areas of interest: equation based modelling

- Large interest in describing non-standard reactions
- Wide range of applications for reactions modelling
- What does this mean for the chemical reaction interface?
Opportunity for Flowsheet Monitoring; e.g. access to H&M balances across applications

Would interfaces for cost & equipment be useful?

Only 1/3 of the respondents use CAPE-OPEN
A majority reports using same thermo over different PMEs

Reported issues with thermodynamic consistency:

- Difficult to diagnose
- Quality Assurance of results is time consuming
- Some users feel that total consistency not possible
- Significant opportunity for improvement
  - Especially across discipline tools (e.g. reservoir/production/process)
Experience with CAPE-OPEN
CAPE-OPEN is known to the majority of the respondents.
User Expectations from CAPE-OPEN

- Interoperability needed for:
  - Thermodynamics
  - Unit operations
  - Property databases
  - Reactions
Expected benefits from CAPE-OPEN

- **Strong emphasis on interoperability**

46 respondents

CAPE-OPEN 2018 Annual Meeting, Ludwigshafen, Germany, October 2018
### Environments

<table>
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<th>Environment</th>
<th>Users</th>
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46 respondents

### CO Units

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<tr>
<td>SCILAB</td>
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46 respondents
Ease of use

50% had a Good or Very Good experience with CAPE-OPEN:
  • Encouraging – the technology delivers what they expect

50% found CAPE-OPEN difficult to use or requiring expert-level support: need to lower the entrance level?
  • CO-LaN (and software vendors) needs to follow up on user’s issues

Answers from end-users and developers!
Perceived benefit of certification

- Strong user support for Certification
- Significant proportion of respondents needing/wishing to know more
Interest in CO-LaN
The awareness around CO-LaN can be improved!
Fairly good understanding of CO-LaN’s missions
Interest in CO-LaN

Majority of respondents are interested in CO-LaN and CAPE-OPEN
Conclusions

- The survey is not yet representative of end-users in the process simulation market.

- Respondents appear to have an affinity to CAPE-OPEN

Hence, the results should not be generalized.
Conclusions

- Awareness/visibility of CAPE-OPEN and CO-LaN
  - CAPE-OPEN is better known than CO-LaN.

- Mixed experience with CAPE-OPEN
  - CAPE-OPEN technology is mature
  - Ease to apply and implement: room for improvement

- Areas for CO-LaN & CAPE-OPEN to expand or strengthen
  - Strong user support & interest for Certification
  - High interest in interoperability of reactions, equipment & cost data.

- Identified interest and potential additional members
  - Many respondents show interest and want to be contacted by CO-LaN