MINUTES OF MEETING



FLACS USER GROUP (FLUG) MEETING

Place: Trondheim, Norway (host Safetec)
Date: 6-7 November 2008
Prepared by: Hans-Christen Salvesen, Idar Storvik, and Prankul Middha
Checked by: Prankul Middha
Approved by: Prankul Middha
Distribution: FLUG mailing list

List of Participants

Name	Organization	Country
Chris Savvides	BP	UK
Ryoji Ogiso	Chiyoda	Japan
Andreas Holm	DNV	Norway
Vincent Blanchetiere	GDF SUEZ	France
Hans-Christen Salvesen	GexCon	Norway
Idar Storvik	GexCon	Norway
Jens Melheim	GexCon	Norway
Kees van Wingerden	GexCon	Norway
Mathieu Ichard	GexCon	Norway
Ole Jacob Taraldset	GexCon	Norway
Prankul Middha	GexCon	Norway
Torunn S. Davidsen	GexCon	Norway
Trygve Skjold	GexCon	Norway
Jerome Hocquet	IRSN	France
Jean-Luc REVEL	Rhodia	France
Brynhild Garberg	Safetec	Norway
Hanne Gøril Thomassen	Safetec	Norway
Jon Andreas Hestad	Safetec	Norway
Kari Frederichsen	Safetec	Norway
Knut Mo	Safetec	Norway
Olga Merete Wiggen	Safetec	Norway
Bjørn Åge Bergsjordet	Scandpower	Norway
Øystein Spangelo	Scandpower	Norway
Sverre Nodland	Scandpower	Norway
Tina Almhjell	Scandpower	Norway
Tommy S. Jørstad	Scandpower	Norway
Ole Kristian Sommersel	StatoilHydro	Norway
Clément Lapierre	Total	Norway
Bjørn Arntzen	UIB / GexCon	Norway
Djurre Siccama	Vectra Group	UK/Netherlands

FLUG meeting 6-7 November 2008

FLUG Chairman: Chris Savvides, BP.

Day 1: 6 November 2008

Welcome to Trondheim and Safetec
Knut Moe from Safetec welcomed the participants to Trondheim on behalf of the host Safetec and informed the audience about Safetec and its use of FLACS.

Adoption of agenda for the FLACS User Group Meeting
FLUG Chairman Chris Savvides, BP, welcomed all participants to the 2 day FLUG meeting. He went through the proposed agenda which was adopted.

Minutes from FLUG meeting 6-7 May 2008 in Bergen, Norway.
Chris Savvides, BP, commented on the earlier discussion about the use of Q9. Torunn S. Davidsen, GexCon, commented that GexCon is working on investigating more about proper use of Q9. Olga Merete Wiggen, Safetec, commented that she would like to have the minutes from FLUG meetings earlier, say 2 weeks after the meeting. Proposed minutes from FLUG meeting 6-7 May 2008 in Bergen, were adopted.

Latest News from GexCon.
Prankul Middha, GexCon, presented some news from GexCon, including new Department Manager of GexCon Software, Erik Aadland, plans for a CRM/Support system, and GexCon offices in United Kingdom, USA, and Sweden.

FLACS Development plans.
Trygve Skjold, GexCon, gave an overview of plans for developing FLACS further in the future. Chris Savvides, BP, asked about bugs in FLACS v9. Idar Storvik, GexCon clarified that FLACS v9.0 includes a core simulator FLACS compatible with FLACS v8, and FLACS v9 also has a new version of the core simulator FLACS. Known bugs/weaknesses in FLACS are registered in a bug tracking system. Chris Savvides, BP, requested a list of all FLACS users including academic users not listed on the FLUG web site.

FLACS User's Manual and GUI development.
Ole Jacob Taraldset, GexCon, presented the new User's Manual and recent updates in the further development of the GUI. A preliminary version of the new manual is currently available at the FLUG web site. The new version contains several new features compared to the previous manual; among others better indexing, and a new topic about "Best Practice". New features in CASD include a so-called underlay functionality (that allows the user to scan and import drawings), better interactive editing of geometry and geometry filtering. It was commented that when using VNC, one must use CASD4 since OpenGL is not supported by VNC. Ole Jacob Taraldset, GexCon, informed that CASD6 will be further developed according to current plans (and not CASD4).

FLACS-Fire
Jens Andreas Melheim, GexCon, presented the current status of FLACS-Fire. A beta version has been available since with the first release of FLACS v9.0 (a full commercial version of FLACS-fire is not yet available). It is possible to model jet and spill fire. However, only modeling of jet fire in the open (with and without crosswind) is thoroughly validated so far. GexCon has plans to develop and validate the models in FLACS-fire further. The user-friendliness of the code will also be improved. Ryoji Ogiso, Chiyoda, asked whether a soot model was included in FLACS-Fire. Jens Andreas Melheim, GexCon, confirmed that a soot model is included, but improvements may be needed.

FLACS Dispersion
Mathieu Ichard, GexCon, presented recent work with dispersion modelling in FLACS. Chlorine and other toxic industrial chemicals represent a significant hazard. Examples of toxic dispersion simulations in FLACS where shown. Plans for further work include improved modeling of flashing jets including two-phase flow.

FLACS Parallelization
Idar Storvik, GexCon, presented plans for a parallelized version of FLACS. In cases where the geometry is large and it takes a long time to compute the considered case, a parallelized version of the core simulator flacs is beneficial. In a first version of a parallel code, the aim is parallelize the linear solvers that are a very small part of the code (ca. 1 %) but use approximately 50 % of the CPU time in a typical simulation.

FLACS Consolidation
Prankul Middha, GexCon, presented plans for further validation of FLACS. So far FLACS has mainly been validated for natural gas, hydrogen, and to some extent for propane and ethylene. Flame and burning velocity models are planned to be further evaluated. Some bugs and weak models may still exist in the code, and further checking and improvements are planned here.

Proposal for Joint Industry Project (JIP)
Kees van Wingerden, GexCon, presented proposed plans for a JIP. Status concerning participants and feedback on the questionnaire sent to FLUG were addressed. And time was spent for discussion among the FLUG members.

Further discussions and end of day 1.
Øystein Spangelo, Scandpower, asked whether a kind of Wikipedia functionality giving users the ability to add advice, has been considered by GexCon in connection with FAQ/User's Guide for FLACS users. Idar Storvik, GexCon, replied that this possibility has been briefly considered so far. Trygve Skjold, GexCon, added that discussions internally in GexCon will continue, among others plans to incrementally update the User's Guide.

Chris Savvides, BP, closed the meeting for the day.

Day 2: 7 November 2008

Welcome, day 2.
Prankul Middha, GexCon, welcomed to day 2 of the FLUG meeting.

Discussion of homework exercise
Mathieu Ichard, GexCon, went through the description of the FLACS exercise, considering pool spread and evaporation. The simulation setup and visualization of results was then demonstrated. Results obtained by GexCon and those sent by two other organizations were compared. An improvement that can be considered is that the MODD parameter in FLACS also is used to limit the number of output lines from pool modeling simulations.

Probabilistic Risk Analysis
Torunn S. Davidsen, GexCon, gave a presentation about how Probabilistic Risk Analysis is done in GexCon Consulting. The method includes in general consideration of theoretical worst case, assumed realistic worst case, and establishing probabilistic explosion scenarios. The topic considered was briefly discussed among the participants.

Gas dispersion above sea from subsea releases
Andreas Holm, DNV, gave a presentation considering gas dispersion above sea from subsea releases. Dispersion simulations with both FLACS and KFX (from ComputIT) have been compared. The effect of turbulence and buoyancy models has been considered. With similar wind profiles and eddy viscosity level at the inlet, approximately the same simulation results are seen for FLACS and KFX. Looking at additional experimental results, preferably at large scale, is beneficial for further validation work considering the dispersion models in FLACS and KFX.

FLACS simulations, comparing new, detailed geometry model with old, more coarse geometry model.
Øystein Spangelo, Scandpower, presented investigations where FLACS simulations using a new detailed geometry model are compared with simulations using an old, relatively coarse geometry model of the same process area (manually made geometry representation based on plot plans, etc.).

A 3D scanning technology was used to create the new, detailed geometry representation. Pipe length data and ventilation conditions were compared for the two geometry models. Much higher simulated overpressures were seen with the new scanned geometry model. In general, simulated explosion loads in the new scanned geometry model were in the order of 4-5 higher than the simulated explosion loads in the old, relatively coarse geometry model. A possible risk reducing measure based on the simulations in the new, detailed geometry model could be to remove some wind walls.

Chris Savvides, BP, commented that it is a possibility to add additional, anticipated congestion in the coarse model. Torunn S. Davidsen, GexCon, commented that GexCon Consulting often apply additional anticipated congestion in geometry models when the congestion level seems to be too low compared to the congestion level in similar geometries. It was asked whether also pressure impulse (in addition to pressure) had been considered in the study. Øystein Spangelo, Scandpower, replied that this had not been done.

FLACS as a risk analysis tool for a toxic gas release
Clément Lapierre, Total, gave a presentation on “FLACS as a risk analysis tool for a toxic gas release”. He proposed some wishes for improvements in FLACS functionality:

- Ability to define each minimum and maximum value for the legend in Flowvis in order to increase the representativeness of the visualization (e.g. a non-linear legend).
- Ability to define the number format in Flowvis (e.g. to avoid like “below 0.0000”).
- Ability to define distance interval (say in meter) inside plot domain windows in Flowvis.
- Ability to optimize the export of video in Flowvis (possibility to extract specific time steps only).

- Increased functionality following the toxic gas concentration (ppm), and a more easy way to calculate the dose variable and if possible a lethality percentage variable.
- Ability to export directly in an Excel table format the values of the r3-file (similar to format of the r1-file exporting).

Idar Storvik, GexCon, promised that these suggestions will be looked into (and some functionality may already be available).

Discussion on FLUG wishes
Improvements in FLACS in the future were discussed. Djurre Siccama, Vectra Group, told about challenging experiences when simulating small leaks in large domains. Trygve Skjold, GexCon, commented that the possibility to use an embedded grid planned to be included in FLACS in the future, is expected to reduce the problem of mass residuals in such simulations. Other measures mentioned by the participants that may reduce the problem off mass residual include; reducing the time step, representing the leakage by a coarser jet, use stable stability class, use small length scale for the initial turbulence, use setup file to totally block porosities that are small based on the algorithm in porcalc (if it is suspected that mass residual is obtained in area with small porosities), and if feasible try to reduce large aspect ratio of Control Volumes.

Djurre Siccama, Vectra Group, mentioned another type of challenging simulation task where the scenario involves combustion of a thin fuel cloud demanding relatively high grid resolution combined with the wish to calculate blast wave effects far away (e.g. 200m away from centre of explosion). The total demand for numerical grid cells can then be very large. Chris Savvides, BP, commented that a possibility is to use FLACS for near field explosion effects and e.g. TNO pressure curves for far field blast wave effects.

Chris Savvides, BP, raised the question about the methods various organizations use for QA (Quality Assurance) for many, say a thousand, simulations. GexCon commented that you may have a colleague look at your simulations with a fresh eye, you may use Linux commands like diff to check changes between different simulations, and you may check thoroughly a few simulation cases serving as starting points and then use scripting to effectively create many (e.g. a thousand) simulations. To search efficiently for any errors in the simulations, it is useful to check the log files (here also Linux commands may be useful).

Next FLUG meeting, future exercises, possible FLACS-II course, AOB.
Next FLUG meeting is tentatively planned to be held on 6-7 May 2009 in Bergen, Norway. Plans for defining an extensive FLACS benchmark for the next meeting were discussed. It was proposed to look at a case where all the steps from making the FLACS geometry to presenting a probability of exceedance curve for overpessures, are covered. One task here is to find a proper geometry that can be used for the purpose and imported into FLACS. It is planned to have an offshore geometry and a land-based geometry available for the FLACS manual, and these geometries may also be useful for an exercise. Such a FLACS exercise should be sent to the FLUG members a long time in advance of the next FLUG meeting. It was commented that it is probably best to have a 2 days FLUG meeting even when a relatively extensive FLACS exercise is discussed as part of the meeting.

Relevant aspects of a possible FLACS-II course were discussed. It was commented that such an advanced course could include a whole example showing what FLACS users typically do in practice. A FLACS-II course could cover topics like gridding aspects (e.g. for a turret) including optimizing the grid, and how to optimize the simulation setup to increase the speed.

It was commented that the FLUG meetings should include more user content, including topics that the FLUG members find challenging when using FLACS in their daily work.

Chris Savvides, BP, will serve as chairman until the next FLUG meeting in May 2009, after which he recommended electing a new chairman for the next period. Thus, election of new chairman will be put on the agenda for the next FLUG meeting. Chris Savvides, BP, closed the meeting, thanking Safetec and GexCon, and all the participants.