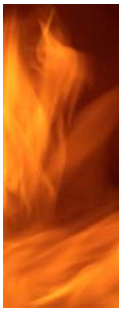
MINUTES OF MEETING

FLACS USER GROUP (FLUG)



Venue: Bergen, Norway, hosted by GexCon
Meeting: 11-12 May 2011
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Distribution: FLUG mailing list

List of Participants:

External Participants

First Name	Last Name	Company	Country
Baptiste	Géniaut	GDF Suez	France
Bjørn	Lilleberg	Scandpower	Norway
Camilla Berge	Vik	Scandpower	Norway
Chris	Savvides	BP	United Kingdom
Clement	Lapierre	IRSN	France
Daniel	Mahoney	Atkins	United Kingdom
Eric De	Carvalho	Total	Norway
Henri	Tonda	Total	France
Jérôme	Taveau	IRSN	France
Jihui	Geng	BakerRisk	USA
Jonathan	Andersen	Scandpower	Norway
Kari	Frederichsen	Safetec Nordic	Norway
Magnus	Lundberg	Scandpower	Norway
Marion	Torre	Total	France
Ole Kristian	Sommersel	Statoil	Norway
Parag	Gupte	ExxonMobil	USA
Pete	Johnson	MMI Engineering	United Kingdom
Prithvi	Pal	Arcadis Vectra	United Kingdom
Ranveig	Niemi	Safetec Nordic	Norway
Remy	Bouet	INERIS	France
Robert	Melville	Atkins	United Kingdom
Steve	Howell	Abercus Limited	United Kingdom
Stian	Høiset	Statoil	Norway
Tien-Yun	Lee	Lilleaker Consulting	Norway
Vegeir	Knudsen	DNV	Norway

GexCon/Internal participants

First Name	Last Name	Company	Country
Are	Bratteteig	GexCon	Norway
Bjørn	Arntzen	GexCon	Norway
Deiveegan	Muthusamy	GexCon	Norway
Djurre	Siccama	GexCon	Norway
Erik	Aadland	GexCon	Norway
Hans-Christen	Salvesen	GexCon	Norway
Helene H.	Pedersen	GexCon	Norway
Idar	Storvik	GexCon	Norway
Lars	Pesch	GexCon	Norway
Lars	Rogstadskjernet	GexCon	Norway
Mathieu	Ichard	GexCon	Norway
Olav R.	Hansen	GexCon	Norway
Prankul	Middha	GexCon	Norway
Trygve	Skjold	GexCon	Norway
David W.	Price	GexCon UK	United Kingdom
Francesco	Chille	ZCStudio	Italy
Norunn	Stene	GexCon	Norway
Remi	Martini	GexCon	Norway
Milinda	Suraweera	GexCon	Australia
Arnt-Lennard	Fuglestad	GexCon	Norway

FLUG meeting 11-12 May 2011

FLUG Chairman: Jérôme Taveau (IRSN)

Welcome to FLUG
Prankul Middha welcomed the participants to Bergen and FLUG meeting on behalf of GexCon.

Welcome to FLUG and agenda for the meeting
The Chairman welcomed the participants to the meeting. The proposed agenda was adopted. In addition to information included in the minutes, copies of (most of) the presentations shown during the meeting can be found at the FLUG web site (login link at http://www.gexcon.com/FLUGmembers).

Minutes from the previous FLUG meeting
The chairman went through the minutes from the previous FLUG meeting in Rome 17 November 2010.

A question was raised if GexCon could plan to prepare so that people not able to travel to FLUG meetings in the future could join by some type of web-meeting solution (e.g. by watching in front of their PC and submitting comments or questions by e-mail). Erik Aadland (GexCon) replied that GexCon will look more into the possibilities here. Chris Savvides raised a question about how FLUG wishes have been addressed. GexCon responded that this would be covered in a separate presentation by Ole Jacob Taraldset later in the day.

Update GexCon Software & international offices.
Erik Aadland (GexCon) presented status from GexCon Software department, including planned improvements, and overview of international offices. The Net Promoter Score survey was presented where the result indicated that 86 % of those responding would recommend FLACS/GexCon to others. Djurre Siccama was introduced as a new addition to the GexCon SW department with responsibility for FLACS sales. GexCon is working on plans for an advanced FLACS course (so-called

FLACS II training course), such a course is expected to be launched at the end of 2011. Several participants at the meeting had suggestions for such a course, among others to include a step by step guidance when new features or application areas are introduced. The proposals that were made included making the users more "professional" and GexCon certifying those that have participated in this course. However, as FLACS changes with them, the "certified user" needs to be updated as well. Dave Price (GexCon UK) had a proposal that FLACS advanced training should have CPD (Continuing Professional Development; http://www.cpduk.co.uk/), and not "certified user" element. Further suggestions from the FLUG members are most welcome.

GexCon Australia: Milinda Suraweera has joined GexCon Australia.

GexCon UK: Dave Price presented himself, and gave a brief overview of ongoing activities in GexCon UK. He indicated that there was more interest in FLACS for onshore applications.

GexCon US: Olav R. Hansen is back in Norway and Scott Davis now leads the office. Currently, there are 5(6) persons and they expect further growth.

GexCon R&D.
Trygve Skjold (GexCon) presented plans and prospects for the R&D department. The next generation of FLACS, FLACS-3 will gradually emerge from FLACS-2. It will be increased focus on documentation, both internally describing technical details of the different models and guidance relevant for the general FLACS user. A new colleague will contribute with expert knowledge related to turbulence modelling. More systematic validation work is also planned.

The R&D department plans for fixed date releases of FLACS (dates to be announced later), an autumn release and a spring release.

Using non-compressible + parallel development version of FLACS could be e.g. 30 times faster on quad core processor.

Chris Savvides (BP) asked how much it is recommended to refine numerical grid using FLACS. Trygve Skjold (GexCon) commented that FLACS will not necessarily converge when refining the grid more and more. Olav R. Hansen (GexCon) commented that in general it is recommended to perform grid sensitivity studies all the time.

FLACS-FIRE
Deiveegan Muthusamy (GexCon) presented status on development of FLACS-FIRE that should be capable of handling large and complex geometries.

Jihui Geng (BakerRisk) asked about the highest velocity that can be handled. It was replied from GexCon that the code can do high pressure calculation and sonic speed.

User Presentations – Session 1

Geometry Modelling using Google SketchUp
Pete Johnsen (MMI) gave a presentation on geometry modelling using Google SketchUp (free version). Some advantages of SketchUp:

- Can quickly draw simple 3D shapes.
- Can customize the GUI and edit shortcut keys.

A down-side using SketchUp is that you may encounter problems with large number of objects. Macro files in FLACS are useful when using SketchUp. Idar Storvik (GexCon) commented that he likes the idea of new ways of using other systems together with FLACS,

Software to orthogonalize geometry ready for import to FLACS

Steve Howell (Abercus/Prospect) gave a presentation on using software, Rhino3D, to orthogonalize geometry ready for import to FLACS. An example was shown in 3D for a drilling derrick. One master geometry database can be created, which can be taken forward to different CFD codes (here FLACS, FLUENT). FLACS macro or .obj format is used (no reliance on .dgn format). The method focuses on

alignment with the FLACS mesh (numerical grid). Oblique objects are converted to “stair-case” objects. The software will soon be available for everyone from www.orthoflo.com

Olav R. Hansen (GexCon) commented that some of the presented things are covered by porcalc (but there are some limitations/weaknesses in porcalc). Are Bratteteig (GexCon) commented that it is difficult to do everything automatically, some manual inspection is needed also when using automatic tool.

FLACS Maintenance

Ole Jacob Taraldset (GexCon) gave a presentation related to FLACS Maintenance. The new versions porcalc2.6 and cofile2.0 are now available in the latest FLACS release. There is ongoing work improving CASD, among others the possibility to save a so-called triangle file, and use a CASD wizard (e.g. for dispersion).

A question was raised about 64bit compiled version of FLACS. The FLACS user may ask (e-mail to flacs@gexcon.com) for such a version (so far only core simulator flacs).

A FLUG Wish List was presented and commented (list available at FLUG web site).

Prankul will make sure that GexCon will send an email to FLUG members when there are updates on the website.

Known issues, problems and workarounds in FLACS

Olav R. Hansen (GexCon) gave a presentation on known issues, problems and workarounds in FLACS. His presentation is available on the FLUG web site. Chris Savvides (BP) commented that the FLACS user should be careful to be within the validation range of FLACS.

User Presentations – Session 2

Coupling of FLACS and USFOS

Camilla Berge Vik (Scandpower) presented how Scandpower has attempted to use USFOS for structural calculations following explosion simulations using FLACS. The aim is to better utilize FLACS giving detailed pressure loads in space and time. The structural model (USFOS) has been used for structural analysis where results based on the traditional approach with a simple triangular pressure load pulse are compared with results based on another approach using detailed pressure loads in space and time from FLACS. Significant differences in the results where seen for the two approaches.

FLACS simulations on storage site

Baptiste Geniaut (GDF Suez) gave a presentation on FLACS simulations on a storage site including a turbocompressor building. Large effect was seen on the level of initial turbulence in the gas cloud. Olav R. Hansen (GexCon) suggested considering using a fan in FLACS to create initial turbulence.

Sensitivity study for gas explosion modelling

Clement Lapierre (IRSN) gave a presentation on sensitivity study for gas explosion modelling. Very high sensitivity is seen in some cases depending on the choices of CFLC and CLFV. It was commented from GexCon that when employing FLACS explosion results, the user should stick to the fixed values CFLC equal 5.0 and CLFV equal 0.5 (the CFL numbers may be changed for dispersion simulations). Very high grid sensitivity for hydrogen explosion was seen in low congested area in some cases.

Olav R. Hansen (GexCon) commented as a general recommendation to do grid sensitivity, and if there are only small changes, it is in general expected to be fairly good quality of the simulated results.

FPSO tank explosion simulations using FLACS

Tien-Yun Lee (Lilleaker Consulting) gave a presentation on FPSO tank explosion simulations using FLACS. It was seen that using different opening pressures for the weak and other area on the tank top (cargo tank design), resulted in significantly different explosion pressures.

Probabilistic explosion analysis in mechanically ventilated areas

Ranveig Niemi (Safetec) gave a presentation on probabilistic explosion analysis in mechanically ventilated areas. It was seen that a pressure versus frequency curve for mechanical ventilation decreased more slowly (decreased frequency for higher pressures) compared to a similar curve for natural ventilation. For mechanical ventilation, it may be considered to employ water deluge to reduce risk.

FLUG Dinner

The FLUG dinner was organized at the Cornelia restaurant in Bergen, 38 people joined the dinner.

Day 2: 12th May 2011

User Presentations – Session 3

Potential improvements of FLACS

Jérôme Taveau (IRSN) gave a presentation on potential improvements of FLACS. He introduced his speech by talking about potential origins of user and code effects/errors. The FLACS user needs both theoretical and practical knowledge, but also formal guidelines and complete, accurate, updated documentation. Jerome focused on grid guidelines and potential difficulties to follow it for onshore facilities (large and flat flammable clouds involved in the explosion, with targets located far away, imply a very large number of grids to follow FLACS grid guidelines). There is also a need to strongly underline that grid sensitivity studies are necessary to put some confidence in results. Also future guidelines could include not only flammable cloud characteristics, but also obstacles layout, size and spacing, gas reactivity, etc. Specific guidelines with practical examples on different application areas will be helpful. The second part of the presentation was devoted to validation. Even though FLACS has been validated against 100's of explosion experiments, no comprehensive validation report is available, so it is difficult, particularly for new users, to know the application and validation domains of FLACS. Building a validation report with a matrix gathering all the validation cases performed by GexCon would allow a better understanding of the application/validation domains of the code, and also help defining a validation strategy for the future. One validation approach that many codes use is the building-block approach, starting from very simple validation cases to validate submodels (e.g. turbulence, flame wrinkling …) and then progressively complicating validation cases to end on full validation cases based on large scale experiments (e.g. explosion in an offshore module). Jerome gave the example of building-block approach used for the ISIS code developed at IRSN. The validation could include a validation sheet for each validation case.

It was concluded that a strategy should be defined promoting improved validation and guidelines, including instructive examples to help reducing user and code effects. Also high quality documentation and sharing of best practices are crucial for the FLACS users.

Trygve Skjold (GexCon) commented that GexCon is working in this direction in the JIP project. Erik Aadland (GexCon) emphasized that documentation is important, there are many new FLACS users, and not everyone can get core competence by visiting FLUG meetings. Chris Savvides (BP) commented that much validation work has been done, and this can be collected into an updated report.

FLACS dispersion and transient leak representation

Are Bratteteig (GexCon) gave a presentation on FLACS dispersion and transient leak representation. The FLACS user should take care in cases where the is a very fat fuel-air cloud (the flammable cloud may increase during dilution depending on the details of the transient behaviour).

Olav R. Hansen (GexCon) commented that the way the fuel cloud is diluted is important (e.g. leaving as a "plug" or being more gradually diluted).

Comparison between FLACS and Star CD for a dispersion case

Daniel Mahoney (Atkins) presented a comparison between FLACS and Star CD for simulation of 2 gas fuel leaks. In general StarCD CCM+ (employing embedded grid) is the preferred tool for Atkins in such dispersion cases. Olav R. Hansen (GexCon) commented that the assumption regarding entrainment of air important, it should be ensured that air is entrained in the near field when considering location of flammable clouds in this area.

FLACS DDT criteria

Jihiu Geng (BakerRisk) gave a presentation related to FLACS DDT criteria. A study has been done exploring the capabilities of FLACS to evaluate potential for DDT in unconfined vapour clouds, comparing with experiments performed by BarkerRisk (UVCE). Maximum normalized pressure gradient has been considered.

Olav R. Hansen (GexCon) commented that it would be interesting if some of the simulations could be rerun using test version of FLACS having dp/dx as output (dp/dx so far manually estimated using FLACS).

Advanced geometry handling in FLACS

Helge Hestetræet and Lars Rogstadkjernet (GexCon) gave a presentation on advanced geometry handling in FLACS. This included the geometry portal (TrueView) and cut plane functionality. Ole Jacob Taraldset (GexCon) commented that the demonstrated new features (so far available only in test version of FLACS) hopefully will be included in the next main release of FLACS.

LNG spreading and dispersion simulations

Eric de Carvalho (Total) gave a presentation on LNG spreading and dispersion simulations. FLACS simulations using October 2009 release of flacs2.2.8 were compared to similar simulations using 2010 release of flacs2.2.8. Eric de Carvalho expressed several wishes improving/extending FLACS, and GexCon plan to include these wishes in a wish list (employing the bug/enhancement system Bugzilla used by GexCon). These wishes include output for exposure time for specified surface area when in contact with liquid or vapour cloud having cryogenic temperature, output for mass of liquid (as function of time) for a user-specified domain.

Large geometries in CASD, and dispersion above sea

Vegeir Knudsen (DNV) gave a presentation related to large geometries in CASD. They have invested in hardware and software tools that enable efficient use of visualization server (client computers can connect using Cygwin and TurboVNC viewer). Vegeir Knudsen (DNV) also presented ongoing work aiming at developing a simple correlation for plume lengths and heights, related to fuel dispersion above the sea. He also expressed a wish to extend FLACS allowing for more than 1000 panels and monitors.

Additional FLUG wishes (not included in earlier presentations)

Prithvi Pal (Arcadis Vectra) would like more leaks available in FLACS. Idar Storvik (GexCon) commented that this may be done dynamically adjusting to memory/computer resources. Another possibility is to have 50 mother leaks, but many children for each mother (equal to mother except for other position). It is also possible to extend so that e.g. one leak releases methane, and one leak releases propane (then one or more additional conservation equations need to be solved by FLACS).

A wish was expressed to upgrade the Gas Explosion Handbook. Trygve Skjold (GexCon) commented that he would like to do this, but GexCon would have to see when it is time for doing this (some graphics have been upgraded already).

A wish was expressed to leave out parameters in CASD when they are not relevant (for the application at hand). Trygve Skjold (GexCon) commented that there is ongoing work in related to this when developing the new CASD menu.

Jihui Geng (BakerRisk) has seen certain problem when running Flowvis, he was encouraged to send a detailed description of this to FLACS support (flacs@gexcon.com).

Eric de Carvalho (Total) expressed a wish to include the release notes for the current and also earlier versions of FLACS in the FLACS v9 manual.

Jérôme Taveau (IRSN) expressed a wish to include automatically generated output of flame arrival time (for one or more positions inside the computational domain).

Prithvi Pal (Arcadis Vectra) expressed a wish to include output for the duration of the pressure peak during an explosion simulation. Idar Storvik (GexCon) commented that it should be possible to develop something here based on certain assumptions.

Eric de Carvalho (Total) expressed a wish to extend Flowvis so that it can be used more easily to measure distance between 2 points (ruler).

Another wish was to get a more detailed description of how panels open.

There was a wish to be able to easily interface FLACS results with other graphing softwares. Deiveegan Muthusamy (GexCon) commented that he has developed a tool that can convert FLACS results to tecplot format.

Formal issues and Next meeting
Dates for the next FLUG meeting are tentatively set to 8-9 November 2011. The meeting is planned to be in London, and DNV London is expected to host the meeting.

AOB
None of the participants brought forward any additional issues.

End of meeting
The speakers and the participants were thanked for joining the FLUG meeting, and the meeting was closed.