GexCon®
A company in the CMR Group

MINUTES OF MEETING

Meeting : FLACS USER GROUP and workshops

Venue : Tractebel, Ariane Avenue 7 - Bruxelles, Belgium

Date : October 21-22, 2004 (workshops and meeting)

Prepared by : Idar E. Storvik, Olav R. Hansen

Participants:

Dirk Roosendans	Atofina
Chris Savvides	BP Amoco Ltd.
Francesco Chille	CESI
Simen Armond	DNV (Det Norske Veritas)
Joar Dalheim	DNV
Seshu Dharmavaram	DuPont
Abdelhamid Nazih	IRSN
Jerome Richard	IRSN
Michael V. Hasson	MMI
Olav Sæter	Norsk Hydro
Jean-Luc Revel	Rhoditech
Anette Urheim	Safetec
Bernt Natvig	Scandpower
Øystein Eriksen	Scandpower
Jens K. Holen	Statoil
Henri Tonda	Total
Axelle Lesage	Tractebel
Daniel Albrecht	Tractebel
Rob Lade	Kidde
Andreas Obrist	SKS
Olav Roald Hansen	GexCon Software
Idar E. Storvik	GexCon Software

Additional distribution: ***FLUG mailing list***

GexCon AS
Fantoftvegen 38, P.O.Box 6015 Postterminalen
N-5892 Bergen, Norway

Telephone: +47 55 57 43 30
Telefax: +47 55 57 43 31
Email: gexcon@gexcon.com

Introduction

This event was a combination of two FLACS related workshops and a regular FLUG meeting.

1) Dispersion and equivalent gas cloud workshop
2) Other simulation topics workshop
3) FLUG meeting

The minutes cover the three parts in separate chapters.

1. Dispersion and equivalent gas cloud workshop

2004-10-21, 12:00, *Tractebel*, Ariane Avenue 7 - Bruxelles

An excellent lunch was served to start with. Many thanks to Tractebel for hosting the FLUG workshops and meeting.

Olav R. Hansen (GexCon Software) wished welcome to the ”Dispersion and equivalent gas cloud workshop”, and the participants (22 in total) presented themselves briefly. Olav described the purpose of the workshop, and presented the agenda for the FLUG workshops and meeting. GexCon invited the participants to dinner for the evening at a restaurant suggested by Tractebel.

Presentation by Olav R. Hansen (GexCon Software):

The presentation topic was "Current guidelines and best practise".

Olav covered a comprehensive list of user guidelines for dispersion scenarios:

- Options (leak, wind, ...)
- Output variables (FMOLE, ...)
- Grid (stretching, refinement, ...)
- Basic testing of jets (free jets, jet in cross-flow, ...)
- Gas monitor region and cs.MON file
- Q1-Q7 explained
- Equivalent cloud (Q5) and expansion equivalent cloud
- Validation of Q5 results
- Ignition of clouds
- Initial turbulence

Comments and questions:

- Chris Savvides (BP): Location and shape of cloud is important as well.
- Abdelhamid Nazih (IRSN): Validation of jet releases for dense gases (try to find some experimental data)
- Henri Tonda (Total): Could the presentations be put on the FLUG web site? (Olav R. Hansen: yes)

Presentation by Bernt Natvig (Scandpower):

The presentation topic was "Some results from QRA studies last year".

Bernt showed a few typical FLACS scenarios, dealing with the following items:

- Jet release, dispersion, and subsequent ignition/explosion.
- Ignition located at turbine intake.
- Validation of Q5 method (comparing real cloud and Q5 cloud explosion pressures).

Conclusions:

- Good results for a large number of simulations, but not to be used always.
- Would like to see some examples on the FLUG web site.

Presentation by Andreas Obrist (SKS):

The presentation topic was "Gas dispersion and explosions in tunnels", based on a presentation given at last Loss Prevention Symposium in Prague.

Andreas presented FLACS scenarios and results, including parts of the QRA study:

- Leak, wind, ignition position.
- Event tree -> QRA: 99.9% of simulations gave $P_{max} < 2.6$ barg.
- Pressure-Exceedance curve (cumulative probability for p > limit).

Comments and questions:

- Olav Sæter (Hydro): What grid resolution and CFL-numbers were used?
- Olav R. Hansen (GexCon Software): We will modify the QL model to improve the dependency of SL on R for pipes (using LSLIM)
- What about the wall roughness in the tunnel:
    - How was it represented? (not?)
    - How could it be represented? (obstacles?)

Presentation by Henri Tonda (Total):

The presentation topic was "Lacq gas plant"

Henri presented a study of a real accident scenario involving toxic dispersion:

- Main hazard: toxic (H2S).
- Using Phast and/or FLACS to study development of toxic gas cloud (real accident)?

Comments and questions:

- Jean-Luc Revel (Rhoditech): Definition of DOSE variable;
  DOSE(t) = integral(FMOLE(t)^alpha * dt, t=t1,t2), alpha=[0.9:2.0]

GexCon AS
Fantoftvegen 38, P.O.Box 6015 Postterminalen
N-5892 Bergen, Norway

Telephone: +47 55 57 43 30
Telefax: +47 55 57 43 31
Email: gexcon@gexcon.com



- Henri Tonda (Total): Need FLACS with 'toxic dose' output and pool evaporation source (H2S).
- Abdelhamid Nazih (IRSN): Which atmospheric conditions were used?
- Olav R. Hansen (GexCon Software):
    - The DOSE variable needs to be refined.
    - The LNG pool model will be included in flacs2.2.6, will check if H2S can be included.

Presentation by Olav Sæter (Hydro):

The presentation topic was "Atmospheric toxic dispersion".

Olav showed results from FLACS and KFX simulations, and also presented some work related to a real incident:

1) Comparing FLACS and KFX (free buoyant jets).
2) Study of an incident at a petrochemical plant: release of propylene.

Conclusions:

- Very large gas leaks; gave very similar results between FLACS and KFX for free jets (varying the wind direction: along, across, against).
- Somewhat larger differences for impinging jets, more confidence in FLACS due to more validation.
- Grid dependency was very small (excellent behaviour).

Comments and questions:

- Chris Savvides (BP): Which code was faster?
- KFX was about 2-3 times faster than FLACS (explanation: KFX solves incompressible flow only, FLACS solves compressible flow).

Presentation by Olav R. Hansen (GexCon Software):

The presentation topic was "Validation of FLACS for atmospheric dispersion". Olav showed results from the so-called Kit Fox and Prairie Grass simulations using FLACS. A paper on this topic had been written by Steven Hanna, Olav R. Hansen, and Seshu Dharmavaram.

Presentation by Olav Sæter (Hydro):

Olav showed an animation made by Anette Urheim (Safetec) during her thesis work: Vortex shedding at a square obstacle with varying wind direction and speed.

Comments and questions:

- (GexCon): Wind-gust (periodic scaling and rotation of wind vector will be available in flacs2.2.6)

Dinner at 20:00 hours

2. Other simulation topics workshop

2004-10-22, 08:30, *Tractebel*, Ariane Avenue 7 - Bruxelles

Olav R. Hansen wished welcome to the “Other simulation topics workshop”.

Presentation by Daniel Albrecht (Tractebel):

The presentation topic was "Accident with a gas pipe line", a quick summary of accident in Belgium was given based on information found in the News. No details could be discussed as investigation was ongoing and further information was of confidential nature.

Andreas presented ongoing work on a recent major accident:

- Gas from a pipeline got into the sewer system.
- Pipe burst (90 barg) lead to a big fire or BLEVE.
- Extremely high thermal loads: radius of 200m, building faces were carbonised.

Presentation by Olav R. Hansen (GexCon Software):

The presentation topic was "FLACS capabilities and new application areas".

Presentation by Jerome Richard (IRSN):

The presentation topic was "Release of H_2 in a room".

Presentation by Olav Sæter (Hydro):

The presentation topic was "Propylene leak in an ethylene factory (real incident)".

Olav presented results from a study related to a real incident:

- 6 gas detectors: low = 50% LFL, high = 100% LFL.
- FLACS simulations seemed to give cloud shapes similar to what was indicated by the detectors.

Presentation by Bernt Natvig (Scandpower):

The presentation topic was "Use of Linux".

- How to optimise your Linux cluster.
- Load balancing using Condor (free software, http://www.cs.wisc.edu/condor).
- Can be compiled into FLACS to have an execution manager (stop/restart).
- Wish list:
    - Job management GUI.
    - Queue management in source code (stop/restart).

GexCon AS
Fantoftvegen 38, P.O.Box 6015 Postterminalen
N-5892 Bergen, Norway

Telephone: +47 55 57 43 30
Telefax: +47 55 57 43 31
Email: gexcon@gexcon.com



- User load statistics.

Presentation by Idar E. Storvik (GexCon Software):

The presentation topic was "Fast acting valves (DESC development)".

Discussions:

Olav R. Hansen (GexCon Software): Brief presentation of the FLACS-explo product.
Seshu Dharmavaram (DuPont): The explo code should have possibility for kappa < 1.4.
Francesco Chille (CESI): Fast acting valves is of interest.

3. FLUG meeting

2004-22-10, 13:00, Tractebel, Ariane Avenue 7 - Bruxelles

Bernt Natvig (Scandpower): Was elected chairman at the previous meeting.

Bernt wished welcome to the FLUG meeting.

Adoption of agenda

The agenda was accepted without changes.

Minutes of previous meeting

Bernt Natvig went through the minutes of the previous meeting. The minutes were accepted.

Actions from previous meeting and comments:

- Best practise manual (not much done, needs further work).

Presentation by Olav R. Hansen (GexCon Software):

The presentation topic was "FLACS R&D roadmap"

- LNG-development
  - Statoil is very interested
  - BP; maybe problem finding money, but interested

Presentations by Idar E. Storvik (GexCon Software):

The presentation topics were "Best practise", showing outline of what had been done for DESC, and information on the upcoming "FLACS V8.1".

Comments and questions:

- Anette Urheim (Safetec): When will there be any development of Casdint?
- A formal FLUG wish list should be maintained: adding new wishes, setting priorities, estimate cost.
- Bernt Natvig (Scandpower): wants to visualise data from multiple directories in Flowvis (could use symbolic links).
- Idar Storvik (GexCon Software): An idea could be to write a 'presentation' script to link or copy FLACS files from multiple directories.
- E-mail notification on FLUG news.
- Henri Tonda (Total): Interested in FLACS development on "dirty gas" (H2S contamination) and Toxic hazard assessment.
- Improved possibility for post-processing using other packages is wanted.
- GexCon: Suggestions and wishes given by e-mail or other written format are welcome.
- Olav Sæter (Hydro): Wants geometry count for a user specified region.

Next meeting

Agreed to be held in Bergen (GexCon would be the host), suggested date at beginning of May, later changed to one and a half day starting at lunchtime 28-29 April 2005.

GexCon AS
Fantoftvegen 38, P.O.Box 6015 Postterminalen
N-5892 Bergen, Norway

Telephone: +47 55 57 43 30
Telefax: +47 55 57 43 31
Email: gexcon@gexcon.com