GexCon
A company in the CMR group

MINUTES OF MEETING

Meeting : **FLACS USER GROUP**

Venue : **GexCon, Bergen**

Dates : **22. November 2000**

Prepared by : **Ole Jacob Taraldset**

Participants:

Kari Frederichsen	Aker Engineering AS
Trond Svendsen	Aker Engineering AS
Chris Savvides	BP Amoco Ltd.
Idar Storvik	CMR AS
Bjørn Arntzen	CMR AS
Tor Langeland	CMR AS
Olav R. Hansen	CMR AS
Arve A. Kvien	Det norske Veritas AS
Lene Stavseng	Det norske Veritas AS
Inger Maren Tveit	Det norske Veritas AS
Solveig R. Ryum	Dovre Safetec
Pierre Foisselon	Gaz de France
Jerome Renoult	Gaz de France
Hans-Christen Salvesen	GexCon AS
Ole Jacob Taraldset	GexCon AS
Jan Roar Bakke	GexCon AS
Øyvind Strøm	GexCon AS
Olav Sæter	Hydro ASA
Emmanuel Faroux	RHODIA
Karl Ove Ingebrigtsen	Scandpower AS
Ingar Fossan	Scandpower AS
Kjetil Kristoffersen	

Additional distribution:

Jan Terje Birkeland	Aker Engineering AS
Øystein Palmgren	Aker Engineering AS
Olga Merete Slyngstad	Aker Engineering AS
Vincent Tam	BP Amoco Ltd.
Thor Egil Foyn	Det norske Veritas AS
Trond Elvehøy	Det norske Veritas AS
Amund Huser	Det norske Veritas AS
David Herrmann	DuPont Engineering
Peter G. Gelblum	DuPont Engineering
Henri Tonda	Elf Exploration Production
Alain Baradel	Elf Exploration Production
Doug Hissong	Exxon Production Research Co.
Veronique Vaslier	Gaz de France
Florian Fourny	Gaz de France
Stian Høiset	Hydro ASA Porsgrunn
Sandra Nilsen	Hydro ASA Porsgrunn
Bernd Broeckman	Inburex GmbH
Abdelhamid Nazih	IPSN-TES-CERS
Michael Rivkind	MEPTEC
Emmanuel Faroux	RHODITECH
Bjørn Hekkelstrand	Scandpower AS
Jens K.Holen	Statoil

1. Welcome
Jan Roar Bakke gave a brief presentation of the merge between GexCon and Department of Processes and Safety at CMR. For GexCons customers it will be business as usual.

2. Adoption of Agenda
The Agenda was adopted without changes.

3. Minutes of previous meeting
The FLUG chairman, Chris Savvides went through the previous minutes of meeting meeting.

4. Actions
- Recommended hardware CASD 5: GexCon to give guidelines
- Produce public version of FLACS98 validation report: GexCon to produce this by 15 March 2001
- GexCon to provide information about FLACS on Web: Available
- Validation of ventilation simulations: not done, but start in week 48
- FLACS I course: mid January, 2001
- FLACS II course: mid March, 2001
- GexCon to provide list of de-classified CMR FLACS reports: to be provided.
- Casdint to include option for defining object name prefix for having multiple macro sets in one database. Next version of Casdint.
- Next meeting: 11/05/01, dinner in the evening of 10/05/01.

5. Presentations by CMR and GexCon

5.1 Future development of CASD and Flowvis, Tor Langeland (CMR)

Tor gave a presentation on the current and possible future development of CASD and Flowvis. The current efforts have been concentrated on porting of
CASD to Windows NT and Linux. This results in CASD version 5. This code is portable between all supported architectures and now contains post processing capabilities. Flowvis is not ported.

- Q: Solveig R. Ryum, Safetec: Can CASD 5.0 run on any computer? Yes, provided it has OpenGL installed.

5.2 New version of FLACS, development, Olav R. Hansen (CMR)

Olav gave an overview of the FLACS development status as well as the release schedule for the commercial version of FLACS. FLACS 99 has been delayed because the sponsors require a more extensive validation of the effects of the new combustion model. The commercial version of FLACS will be released as follows:

- FLACS 99 version 2 delivered by end of 2000
- FLACS 2000 delivered by April 2001

FLACS 99 v.2 will have bug fixes and enhancements/new applications compared to FLACS 98, but the gas properties will be the same as in FLACS 98. There will be no significant difference in simulation results.

5.3 Future development of FLACS, Jan Roar Bakke (GexCon)

Jan Roar gave a presentation on possible future FLACS development projects run by FLUG. Examples of tasks performed in such a project were shown and possible ways of financing:

- Increased Support and Maintenance fee
- JIP
- Task by task

GexCon will produce a proposal for discussion among the FLUG members. A revised proposal will be a basis for discussion at the next FLUG meeting.

6. Presentation by FLACS users

6.1 Ingar Fossan, Scandpower

Ingar Fossan gave a presentation of a grid sensitivity (GS) study performed at Scandpower. In a highly enclosed module (20x20x14 meters) gas cloud size, gas cloud location and ignition location were varied. For the smallest gas clouds no GS was seen, but for some scenarios P0 = 5 P1 when doubling the grid size. The pressures were low, critical pressure = 0.15 bar for this module.

- C: Chris Savvides, BP: Because of the very low pressures the difference in pressure is due to numerical errors and not GS.

- C: Pierre Foisellon, Gas de France: Possible that by changing the grid and not the ignition point the ignition point location will be moved from end CV to CV number 2 from end. This will change the way the initial flame propagation is modeled.
- C: Olav R. Hansen, CMR: Probably too low resolution to fully describe the flame front during the initial phase of the simulation.

6.2 Olav Sæter, Norsk Hydro

Olav Sæter talked about the FLACS guidelines used for Phase 3B. The FLACS guidelines states that a gas cloud must span at least 5-6 CVs in each direction for the initial phase of an explosion simulation to develop correctly. Hydro studies shows a discrepancy between simulations and experiments when following these guidelines. Explosion overpressures from small gas cloud will be under-predicted. The solution is to have a higher resolution in gas clouds. Olav Sæter proposes new guidelines for unconfined gas clouds: "It is recommended that the numerical spatial resolution across an unconfined gas cloud should be resolved with at least 13-15 grid cells." Olav presented results which shoed that this gives good results for small to large gas clouds. In addition a uniform grid should be used inside the gas cloud. An unconfined gas cloud means gas regions facing at 3 or more open boundaries.

- C: Olav R. Hansen, CMR: Current guidelines are for confined gas clouds (between walls/decks) and they still apply.
- C: Scandpower: It is important to also check simulation results for grid dependency in addition to using guidelines.

6.3 Hans-Christen Salvesen, GexCon

Hans-Christen Salvesen gave a presentation about study performed by GexCon involving natural gas evaporating from a pool of LNG. A tank with a dike around it started leaking and NG evaporated from within the dike. The LNG did not run over the edge of the dike. To be able to perform this study a special version of FLACS was developed.

6.4 Solveig R. Ryum, Safetec

Solveig R. Ryum described problems she had with running FLACS on a PC running Linux. The simulations are unstable and completely equal scenarios can give different answers. GexCon/CMR has done extensive research to find the cause of the problem. The problem seems to be caused by special hardware in the Dell computer.

6.5 Chris Savvides, BP

Chris Savvides presented work he has done on gas dispersion cases. For small leaks FLACS results compare well with experimental results, but for medium/large (5-10 kg/s) leaks FLACS under predicts. Chris suggests that a better method of performing explosion studies in equivalent gas clouds, than is used today, is to include all gas above 5% in equivalent gas cloud.

- C: Scandpower: Very small changes in scenario can give relatively large changes in results. Scandpower uses "gas concentration profile" to get around this.

7. Election of new Chairman
Olav Sæter was suggested by GexCon and was elected by acclamation.

8. General discussion
The discussion concent rated on possible improvements/changes to FLACS:

- Chris Savvides, BP: List of elements which are exported through Casdint from Datal file, and which elements are skipped.
- Scandpower: Utility for generating ASCII porosity file and output of combustion products
- Pierre Foisselon, Gaz de France:
  - Plot ASCII files in Flowvis
  - Interactive controls in FLACS
  - Plot flame speed in Flowvis
  - Plot Pmax in Flowvis
  - Output of volumetric concentrations
- Jerome Renoult, CMR: Define fan in scenario