
◆ G-4 NEWS ◆

Volume 5 Issue 2

The Newsletter for Oxygen Compatibility Practitioners

Fall 1998

Primo Short Course Wows Committee

A full-dress, preview of the four-hour oxygen system operators and maintenance level course (initially developed at NASA WSTF) was given to the Committee at Cocoa Beach by Elliot Forsyth and Mike Shoffstall. The practical, focused content was remarkable for its polish, and the Committee was eager to make it available to the entire oxygen community.

At present, the slides used with the

course, which incorporate quizzes and exercises, will be used as the hand-out materials for the course. A G-4 Task Force has commented on the slides to ensure suitability.

The course package is being submitted for scheduling. First public offerings of the one-day course are planned for April 20 and 21 in Atlanta GA, and October 19 and 20 in Denver CO. Contact Scott Murphy (610) 832-9685 for a brochure **G4N**

Yentzen Pens G-4 Saga

Michael Yentzen has written a history of the G-4 Committee and its significance for the November 98 issue of *Standardization News*, which is highlighting the progress of Committees formed in the last quarter of ASTM's century. Look for it! See how oxygen compatibility may have been important in the dinosaur era.

This history is a starting point for a more thorough elaboration of the G-4 experience at the Committee's Y2K celebration. **G4N**

E-Mail to Help G-4 News E-volve

Last Spring, *G4 News* was E-Mailed as an Acrobat (.pdf) file to 20 subscribers whose Internet addresses were on file. Feedback was enthusiastic.

Rapid delivery was cited. Ditto ease of copying others. Ditto the option to archive the newsletter and to make it a resource on company LANs. And some of our number just plain like E-Mail.

G-4 likes E-Mail, also. It allows self-subscription on the Internet, more use of color and figures, flexible length, and in the long run it can save money. And E-Mail distribution is the wave of the future.

So, G-4 has begun a campaign to drive itself out of the hard-copy newsletter business. We strongly encourage all of our subscribers to provide E-Mail addresses (See coupon p. 3). A subscription engine is being sought for the Web Site. However, hard copies will continue until we determine that E-Mail is successful. So, if you or your company have been thinking about entering cyberspace, here is yet another incentive. **G4N**

Progress at Cocoa Beach:

.....*Between smoke and wind!*

After the long summer of fires in Florida, G-4's meeting went without hitch, despite the approaching Hurricane: Georges .

The **Main Committee, G4.00** affirmed an Education Subcommittee recommendation to adopt instructor certification methods and to adopt a short course.

Test Methods G4.01 balloted and finalized G 121 on cleanliness test coupon preparation. G 86a on Mechanical Impact Testing was also finished and is now being readied for adoption by ISO. A presentation on CTFE was made (see *Daikin...* p. 2). Status of the transfer of military standards to G-4 was not changed. Jake Jacob reported on several additional incidents of fire in 4500 psig rapid-filled breathing air cylinders. A hardware test procedure involving rapid oxygen flow with entrained particles through devices was discussed but action was deferred.

Practices G4.02 balloted G 63 on Nonmetals and adopted it but agreed to ballot a few further changes. G 94 on Metals was reapproved as is. A revision of G 114

on Aging of Materials was balloted and approved. Construction of the final-task hardware was reviewed for the ISP on thick stainless steels. Solicitation of funding for the ISP on metals at high temperature have been mailed and four sponsors have been identified

(See *Progress on page 3*)

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Fall '98 Seminar Series

The Fall G4.05 Education Committee Seminar series hosted three technical papers. Titles and abstracts for them are given below:

"Failure Analysis of Fires in Oxygen Production Process Valves" by Harold Beeson, John Ginter, Doug Dobbin and Elliot Forsyth

Abstract: The NASA Johnson Space Center White Sands Test Facility (WSTF) was requested to perform a failure analysis on damaged hardware from a series of fires that occurred in an oxygen production process (OPP). The purpose of the analysis was to determine the cause of the fire. The fires occurred in five valves in separate incidents in two different applications. The approach of the analysis was to understand the system configuration and operation, review the fire scenario, and analyze the system for possible ignition mechanisms. The evidence was then reviewed and analyzed, using microphotography and macrophotography, SEM, and chemical analyses. The evidence was then used to prove or disprove various failure scenarios. This paper reports the results of the analysis and provides recommendations for improving the resistance of the system to ignition and combustion.

"Positive Displacement LOX Pump Fire," by John S. Zabrenski:

Abstract: A fire that occurred in a positive displacement liquid oxygen (LOX) pump is described. This fire was unusual in that the pump was pressurized with gaseous oxygen, but not run-

ning at the time of the incident. Based on a fundamental analysis of the flammability limits of the pump components, a mechanism for the fire is offered.

"Sonic, Supersonic and Other Extreme Velocities in Oxygen Systems," by Barry Werley:

Abstract: A rule of thumb used in the design and understanding of oxygen systems is the condition of critical flow. During critical flow, "sonic" velocities are produced and the mass flow rate is limited (when the absolute differential pressure ratio is about 2:1). However, although the flow is limited, this condition does not preclude the achievement of supersonic velocities of potential concern to oxygen compatibility practitioners. Nor does it preclude sonic velocities and other disproportionate velocity levels under "subcritical" conditions in some hardware. Tutorial on the basic criteria for flow limitation and velocity development is reviewed, hopefully simplified, and related to oxygen system components.

The Harold Beeson et al. paper will appear in the proceedings of the next G-4 symposium to be published in 2000. Copies of the Zabrenski paper were distributed at the meeting. Electronic copies (Adobe Acrobat .pdf format) of the John Zabrenski, and Barry Werley papers may be requested over the internet from werleybl@apci.com. These require the use of a "Reader" that may be downloaded free from www.adobe.com. The Zabrenski paper is available now, and the Werley paper should be available in one to two months. **G4N**

Daikin Overviews Status of CTFE

Dr. George Lin of Daikin America Inc., addressed the G4 Committee at the September 23, 1998 meeting and provided technical information on the history, properties and use of the Daikin CTFE products being sold under the trade name "Neoflon". Dr. Lin indicated that Daikin has been producing CTFE resin under the trade name Neoflon since 1955. The 3M Corporation purchased Neoflon M-400H and M-300P and resold this resin as Kel-F (Kel-F-6061 and Kel-F KF-6060, respectively) during the years from 1991 to 1995. In 1995 the 3M Corporation stopped marketing Kel-F. At present, only Daikin and another company in Russia produce the CTFE resin. Dr. Lin presented data on the resin including deformation under load, crystallinity effect on physical properties, heat aging properties, and compression molding temperature effect on molecular weight.

Four grades of Neoflon CTFE can be obtained from Daikin depending on the specific end-use application. Dr. Lin indicates that the Zero Strength Time (ZST), which is an indirect measure of molecular weight, is the most critical single parameter for demanding applications. He recommended that high ZST products, such as Neoflon M-400H, be used where mechanical stability is desired. He cautioned, however, that material processing is critical to the final material properties and that high temperature processing, including high temperature extrusion molding, could produce a final product having a low ZST (i.e., low molecular weight) even when starting with high ZST resin. He indicated that compression molding produces generally better property control than extrusion molding where high ZST is desired. He also indicated that crystallinity, which also affects deformation under load, is very difficult to control with extrusion molded product.

In response to this information the G 4 committee has added Daikin representatives as well as representatives of two material processors to the task group studying Neoflon oxygen compatibility. At present, Daikin representative's caution that both the starting grade and the final processing be carefully specified and controlled by the end user, depending on the application and mechanical demands. **G4N**

G-4 Web Site

<http://www.wstf.nasa.gov/oxcompat/>

The Web Site has received several recent updates. It now contains the newest G-4 Utilities files and the current newsletter. The parent Web Site at NASA WSTF is also undergoing many

changes and further updating of the oxygen section is expected. As a result, the Website address has changed again as shown above. **G4N**

(Progress from page 1)

so far that should allow the program to begin (but one or two more sponsors would be helpful). A Web-searchable materials database is maturing at Wendell Hull Associates, and this item will fall under the Education subcommittee in the future. NASA's oxygen system design guide will now be published as a ASTM Manual rather than as a standard. A new ISP on flammability of oils in moisture-laden oxygen mixtures has been drafted (see article p. 3).

Long Range Planning G4.04, continued discussions on its proposed five-year plan. The plan was adopted as a living document, and transfer of items to specific Committees or persons is begun. The Committee will audit progress at each meeting.

Education G4.05 reported 29 students attended the On-site TPT course and 60 students attended at three other sessions since the Fall meeting. There were three seminar papers (see *Fall...* page 2) and Elliot Forsyth presented a preview of a future paper on oil film ignition. A preview of a four-hour operator and maintenance course was seen by the Committee (See *Primo...* p.1). The committee considered methods of certifying instructors for the G-4 courses requiring attendance at the course and an audition.

Symposia G4.06 continued planning for the next symposium. Accommodations and tentative paper commitments were discussed. Electronic publication means were discussed but may not obtain by 2000. The Call for papers will issue shortly and the abstract deadline date will be Jan 20, 1999.

Publicity G4.94 decided to begin a gradual transition to exclusive distribution of *G-4 News* by E-mail (See *E-Mail...* p. 1). Style, content and future stewardship of both the Newsletter and Web Site were discussed and tweaked.

Research G4.92 did not meet.

Statistics G4.93 accepted a task to prepare a proposal to evaluate whether incident information could be made accessible in the Wendull Hull & Associates database and ensure a mechanism for sanitizing those data that exist.

Executive G4.90 approved five new members, proposed Ulrich Koch and John Cronk as delegates to the 1999 ASTM Board of Directors Nominating Committee, approved several proposed revisions to ASTM Regulations, authorized the Research subcommittee to prepare a technology workshop for the days preceding the meeting in Seattle (more info will follow), and last but not least, *kept this Committee's nose to the grindstone.*

G4N

Draft ISP Proposes Testing of Oil Flammability

G-4 has been following the progress of CGA Task Force 96-86 on *Definition and Requirements for Oxygen-Rich Mixtures* through several common members. This Task Force has submitted a recommendation to the full **CGA Atmospheric Gases and Equipment Committee** to publish both a Safety Bulletin on cleanliness of oxygen-containing gas systems and a Technical Note on the data used to formulate the recommendation. The full CGA Committee must deliberate on the documents before they can be published and they may be significantly altered in the process.

However, G-4 has learned from reliable inside sources close to the Task Force that one recommendation calls for oil-flammability experimentation to sort out some of these data. One route to such testing might be an Industry Sponsored Program (ISP) that G-4 could design. G-4 contains a good mix of people to propose a program and a recently formed Task Force has begun design efforts.

The dilemma, as it appears, is that the oxygen producing industry has experienced fires and explosions at oxygen concentrations as low as 3.5%. In comparison, commercial compressed air systems operating at a much higher 21%

oxygen level have a remarkable safety record (and at less than optimum system cleanliness levels, to boot).

Many oil contaminants are known to have a substantial solubility for oxygen that increases with pressure. Might these oils have different capacities? Also, ordinary compressed air contains much more moisture than cryogenically produced gases. Might moisture inhibit ignition through such things as dissipating static charge separation? Further, some of the noncryogenically produced oxygen also contains elevated moisture. Might these systems be more tolerant of contamination? Indeed, might moisture be controlled (Min. and Max.) in cryogenically produced oxygen to tame the prospects of fire?

A G-4 Task Force ISP first draft involves measuring the rate at which oxygen dissolves into oils at various pressures, whether such mixtures are sensitive to ignition in bulk or as films, and whether the presence of water vapor reduces the sensitivity or capacity of such oils. A decision to solicit funding may be made next Spring.

Outside comment is welcome. To review the draft, visit the WebSite (see p. 2 for URL) where copies may be downloaded as Acrobat (.pdf) files. **G4N**



I want G-4 News!

Your name will be listed in our publicly available database of oxygen compatibility enthusiasts, please check *all* boxes that apply to you.

New Request Correction E-Mail Update

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- G-4 Member
 G-4 Symposium
 G-4 TPT Course Student
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 Commercial Testing Source
 General Interest in Subject



Return to: Steve Mawn, ASTM Committee G-4
 100 Barr Harbor Drive, West Conshohocken PA 19428-2959

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G-4 NEWS



ASTM Committee G-4
100 Barr Harbor Drive
West Conshohocken PA 19428-2959

Non-Profit Org.

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G-4 Events and Housekeeping

Regular meetings of the Committee G-4 have been scheduled as follows:

Mar 17-18, 1999Seattle, WA
Sep 15-16, 1999Las Cruces, NM
Mar 15-16, 2000Toronto, Canada
Sept 26-27, 2000.....Paris
Mar 14-15, 2001.....to be determined
Contact Steve Mawn (610) 832-9726 for details or membership data. ASTM Membership is \$65 per year.

The next G-4 Symposium is :

Sep 28-29, 2000Paris

For a Call for Papers or Program, call Steve Mawn (610) 832-9726.

Public offerings of the course: *Controlling Fire Hazards in Oxygen Handling Systems* are planned for:

Mar 15-16, 1999Seattle, WA
June 22-23.....Philadelphia PA
Sept. 13-14.....Las Cruces NM

Contact Scott Murphy (610) 832-9685 for information or brochure. Cost is \$675.00 (including text). It can be of-

ferred at your site for a negotiated price.

The course text: *Fire Hazards in Oxygen Systems* may be ordered separately from Scott Murphy, (610) 832-9685. Price is \$250 (2 volumes).

A 210-page compilation of 23 1997 ASTM Standards on oxygen safety is available, Stock #FIRHAZ, \$68 in the USA, \$75 elsewhere, (610) 832-9585.

The G-4 Videotape *Oxygen Safety* PCN 12-700880-31 may be ordered from ASTM Customer Service at (610) 832-9585. Price \$75 (\$67 for members).

Recent G-4 Standards actions/revisions:

G 86a "Mechanical Impact....."

G 121 "Specimen Preparation..."

G 63 "Nonmetals..."

G 94 "Metals ..(unchanged)"

G 114 "Aging Test Specimens...":

All G-4 standards appear in part 14.02 of the Book of Standards or may be ordered individually from ASTM Customer Service (610) 832-9585. Typical standard prices range \$15-30.

Details:

This newsletter is a product of ASTM Committee G-4. The editorial staff is the G-4 Committee Officers and ASTM Staff:

G4 Chair	John Cronk
G4 Vice Chair	Bill Royals
G4 Secretary	Ron Epstein
.01 Test Methods	Coleman Bryan
.02 Practices	Ting Chou
.03 Terminology	Harold Beeson
.04 Planning	Paul Klein
.05 Education	Michael Yentzen
.06 Symposia	Hervé Barthélémy
.90 Executive	John Cronk
.91 Editorial	Stephen Bonafazi
.92 Research	Theodore Steinberg
.93 Statistics	Barry Newton
.94 Publicity	Barry Werley
ASTM Staff	Steve Mawn

Mail to: **G-4 NEWS**, Steve Mawn, ASTM Committee G-4, 100 Barr Harbor Drive., West Conshohocken, PA 19428-2959, Phone (610) 832-9726, Internet: smawn@astm.org