

Quarterly Progress Report

Project Title: Field Trial of a High Capacity Gas-Fired Paper Dryer

Covering Period: October 31, 2004 to December 31, 2004

Date of Report: January 14, 2005

Recipient Organization: Minnesota Department of Commerce

Partners: Gas Technology Institute; Western Michigan University; Liberty Paper Inc.; Groupe Lapperriere & Verrault Inc; Flynn Burner Corporation

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1. Project Objective: Two or three sentences stating overall project objectives.

The primary objective of this effort is to full-scale design and field-evaluate an innovative, lower cost, gas-fired paper drying technology to confirm the technical and economic benefits for the drying limited paper mill. The successful project completion will result in technology licensing to GL&V USA Inc. (Hudson Falls, NY) for the commercialization showcase at Liberty Paper Inc., an LDI Company (Becker, MN).

2. Background: Outline the reason(s) for the project; the technical issues being addressed, and a brief summary of work in previous quarters or years (one or two paragraphs).

Paper drying is the most energy-intensive and temperature-critical aspect of papermaking. It is estimated that about 67% of the total energy required in papermaking is used to dry paper. The conventional drying method uses a series of steam-heated metal cylinders that are required to meet ASME codes for pressure vessels, which limits the steam pressure to about 160 psig. Consequently, the shell temperature and the drying capacity are also limited.

Gas Technology Institute together with Groupe Lapparier and Verreault (GL&V) USA Inc., Flynn Burner Corporation and Boise Paper Solutions and with funding support from the U.S. Department of Energy, U.S. natural gas industry, and Gas Research Institute has developed a high efficiency gas-fired paper dryer based on a combination of a ribbon burner and advanced heat transfer enhancement technique. The Gas-Fired Paper Dryer (GFPD) is a high-efficiency alternative to conventional steam-heated drying drums that typically operate at surface temperatures in the 300°F range.

The new approach was evaluated in laboratory and pilot-scale testing at the Western Michigan University Paper Pilot Plant. Drum surface temperatures of more than 400°F were reached with linerboard (basis weight 126 lb/3000 ft²) production and resulted in a 4-5 times increase in drying rate over a conventional steam-heated drying drum. Successful full-scale GFPD development and further commercialization of this technology will provide large energy savings to the paper industry and increase paper production rates from dryer-limited (space- or steam-limited) paper machines by an estimated 10 to 20%, resulting in significant capital costs savings for both retrofits and new capacity.

3. Patents: Identify all patents applied for or resulting from this award.

There was no patent application filed for the reporting period

4. Publications/Presentations: Identify and attach all publications and presentations made for industry or government groups resulting from the award during this quarter.

There were three major presentations made during the reported quarter (attached):

10-27-04: Kick-off meeting at LPI (Becker, MN)

11-02-04: International Gas Research Conference (Vancouver, BC, Canada)

12-02-04: Technical meeting at GTI Headquarters (Des Plaines, IL)

5. Progress in Past Quarter and Current Status: Include the activities performed during the reporting period, and identify any issues or concerns related to tasks, schedule or budget. Progress should be reported relative to the approved tasks identified in the Statement of Work.

Milestones:

	<u>Date</u>
Draft full-scale GFPD design developed	12/31/04
Final GFPD design completed	06/30/05
GFPD components fabricated, purchased, assembled	12/31/05
Baseline test/auditing completed	12/31/05
Field trial completed	06/30/06
Final Technical Report	08/20/06

The following activities were performed during the reported period:

- Project kick-off meeting was hold on 10-27-04 at LPI manufacturing facility (Becker, MN)
- Project team evaluated the pilot-scale test results and developed basis for the full-scale design
- Sub-contractual work scope was drafted up and forwarded for FBC and GL&V review
- Full-scale GFPD design was drafted up and forwarded to project partners review (attached)

6. Plans for Next Quarter: Identify activities to be performed during the next quarter.

- Execute sub-contractual paperwork (FBC, GL&V)
- Finalize Field Test Agreement (enclosed draft is under project partners' review)
- Finalize GFPD combustion system design
- Initiate baseline testing/audit at LPI paper machine (Becker, MN)
- Present GFPD technology at 2005 NGT III Conference (Orlando, FL)