"Recent Developments and Needs for Wildfire Fighting on the Ground: Tactics and Technologies"

Video conference, **Athens 10/6/2010**

A new fire fighting *hose: Field testing*

Prof. M. Statheropoulos, European Center for Forest Fires (ECFF)

Assoc. Prof. A. Pappa, National Technical University of Athens (NTUA)

Dr S.Karma, National Technical University of Athens (NTUA)

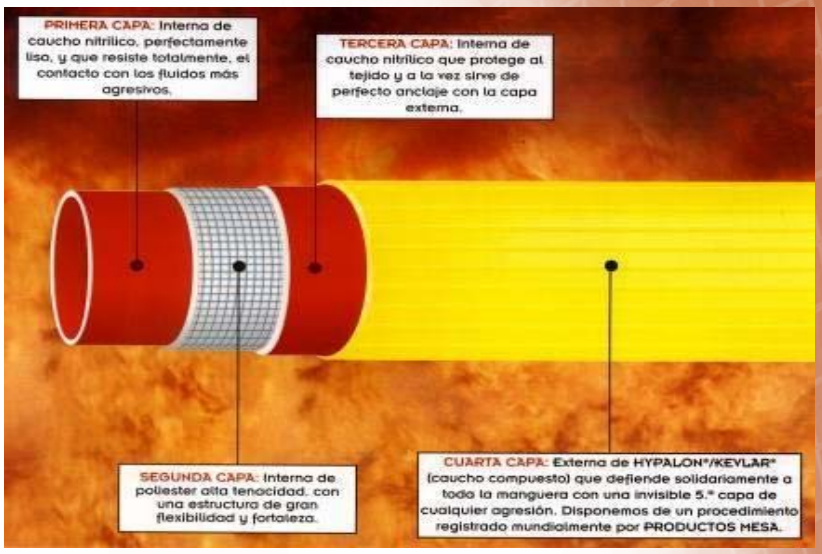
FP7 FIRELI project (Grant agreement No 222152)

Field Analytical Chemistry and Technology Unit/
National Technical University of Athens (FIACTU/NTUA)

Contents

1. The FIRELI product
2. Planning session of fire tests in the field
3. Results and evaluation
4. Conclusions

1. The FIRELI product



- composed by a 4 layer co-extruded polymer with sufficient fire and abrassion resistance and cleaning capacity
- harmonized design suitable for field-use (light weighted, smooth shape)
- enhanced fire retardancy due to the use of a coating fixed to the coupling

2. Planning session of the fire tests in the field

•Tests for hose performance with the contribution of Hellenic Fire Brigade

• Safety plan was established for the field tests (mock-up trials prior real experiments)

• Objectives of the field tests

1)To test the hose time-life of operation before any water leaking

2) To test the time-life of the hose before any melting or burning of the hose

Test Protocol

•**Site :** National Technical Universit

Campus (restricted open field)

• **Scenario:** Controlled fires of fore

biomass representing the

Mediterranean flora

- Flaming and smouldering phases of a forest fire were **simulated in the scenarios**

- Procedures were mainly focused on **smouldering-glowing** phases of the fire

Procedures for testing hose performance (1)

- Exposure to both approaching fire-front and inside fire-front during the flaming phase, having water circulation inside the hose

- Exposure to smouldering-glowing phases having water circulation inside the hose, until water leaking in the hose line is observed

The FIRELI hose during the flaming phase of the fire

Procedures for testing hose performance (2)

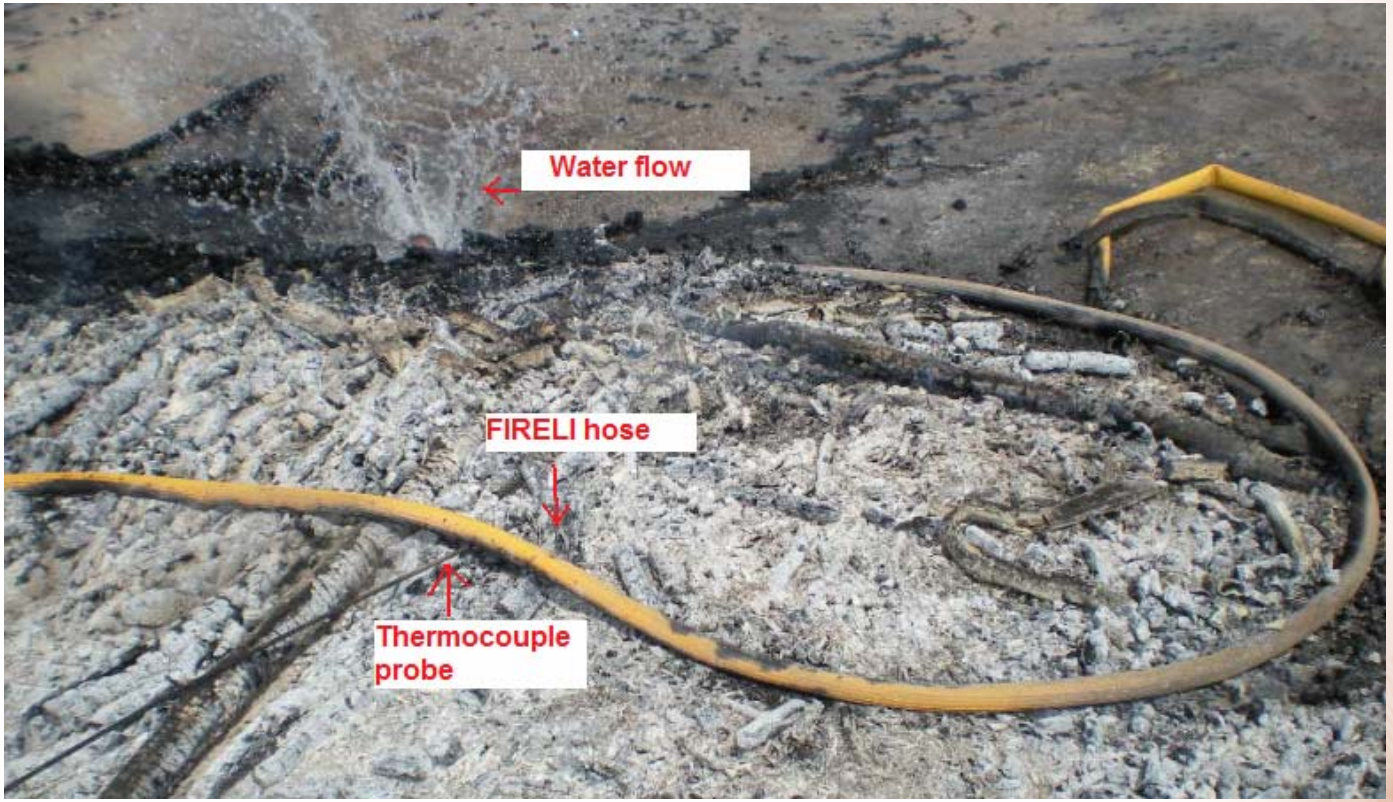
• Exposure to the smouldering-glowing fuel bed without having water circulation inside the hose for about 5 minutes; then the water was re-circulated

•The hose line was drawn through the fuel bed during the smouldering-glowing phases: test of the combined thermal and abrasion resistance

The FIRELI hose during the smoldering-glowing phases of the fire

Field Monitoring(1)

The heat profile of the fire was monitored



Field Monitoring(2)

• **Visual camera :** for recording the whole experiment (maximum and average height of the flames, spreading velocity of the flame-front)

• **Thermo-graphic camera :** for monitoring the temperature profile of the hose line during the fire

Thermographic camera in the field (FLIR P65)

Visual camera in the field

Field Monitoring(3)

Sound recording: A condenser / shot gun microphone (AKG C391B – SE300B) has been employed to record the audio frequencies

• Meteorological conditions were measured during the fire test by using a field meteorological station (Kestrel 4500 Pocket Weather Tracker)

Field Monitoring(4)

- **Combustion G**as monitoring: **CO, CO_2, O_2, NOx** (MRU Delta 1600-V)

Gas analyzer measuring during the field experiment

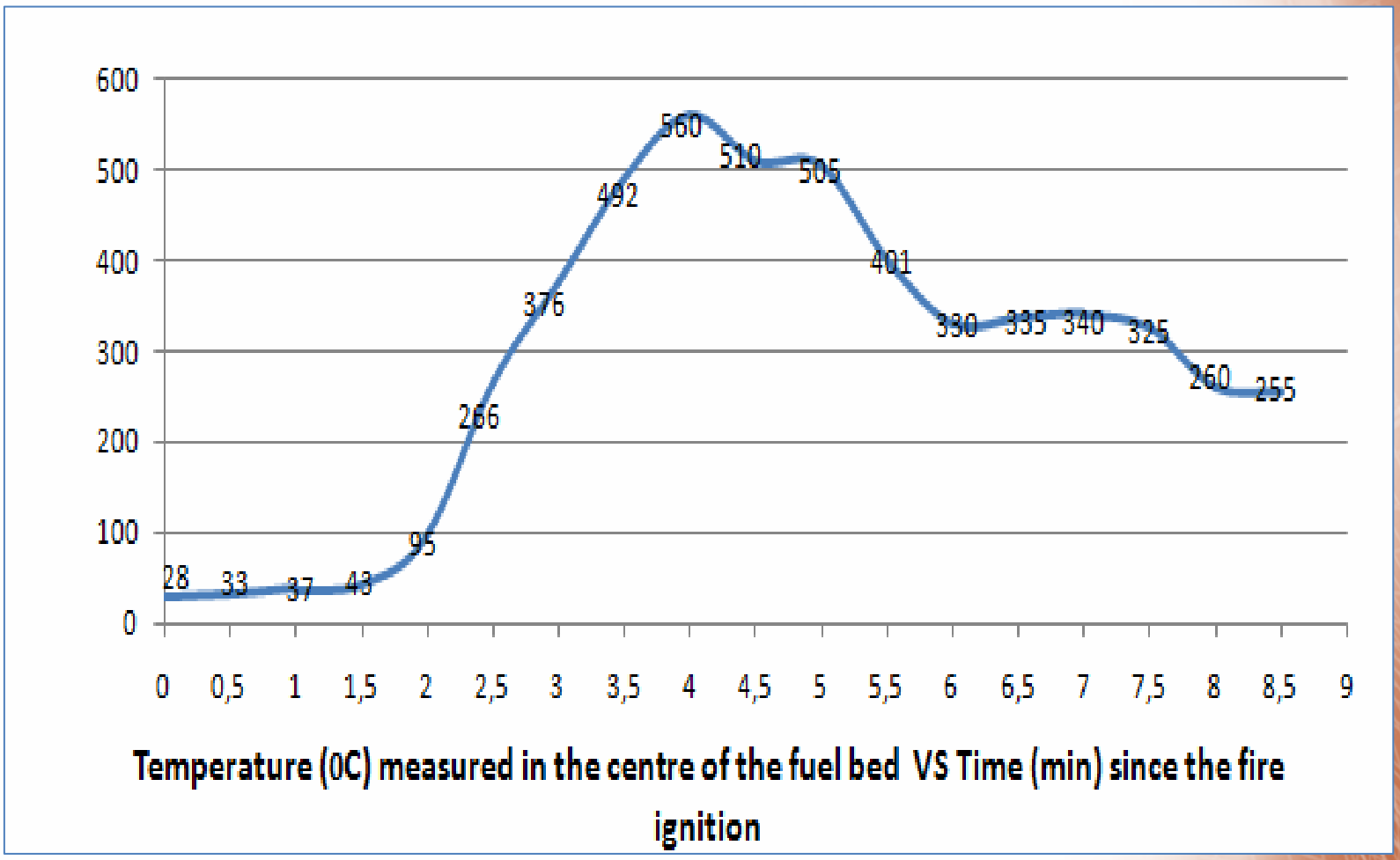
- Other gases monitoring: **H_2S, NH_3, O_2 and LEL%** (RAE)

Field Monitoring(5)

- CO/CO_2 detector: Anagas CD 98 Plus, linearity area: 0–60%)

- A portable particle analyzer (DustrackTSI, linearity area: 0–100 mg/m^3) was used for measuring concentration levels of $PM_{2.5}$ around the fire.

3. Results and evaluation (1)



Temperature profile of the fire-front approaching the FIRELI hose at the center of the fuel bed

Results and evaluation (2)

- ***Thermographic camera***

Thermographic images showing the four phases of the fire during the field experiment

4. Conclusions (1)

FIRELI hose performance in the tests is summarized:

•Flaming phase (water circulation): Hose life before melting and burning had an average of
1 min exposed to a temperature range of 266 to 560°C (average temp. 380°C)

•Smouldering/glowing phases (water circulation): Hose life over 10 min without any water leaking in a temperature range of 216 to 538°C (average temp. 370°C)

• Smouldering/glowing phases (without water circuation): hose life 8 min before becomes un-operational

• Combined smouldering/glowing phases and abrassion resistance (without water circulation): No deterioration was observed after 5 passings through the fuel bed

Fireli product has performed successfully in the field tests

Conclusions (2)

In general:

- It seems that combined visible and thermographic camera **can effectively used for field test of fire hoses**

- **Chemical data** can be used **for both identifying the fire phases** (e.g. flaming, smouldering, glowing) but also as a simplified **early warning system for safety reasons.** Critical chemicals, such as **CO** and **particles** can be monitored.

- Use of **sound recording** was quite experimental with the scope of investigating if the **integration of images, sounds and chemical data** can provide an advanced method, as part of a protocol for field testing of fire hoses