SIXTH FRAMEWORK PROGRAMME

Contract n° FP6-031486

“Effective operations in ports”

SP2 – Ports & Environment

22-23 September 2009
WP 2.3 - Air Quality

- Industrial application

CFT (Compagnie Fluviale de Transport)
Why an IWT company is involved in the EFFORTS project?

• Development of an environmental policy since many years and ISO 14 001 certified
  \(\Rightarrow\) *CFT is concerned by air quality problems*

• EFFORTS project aims to Maritime operations but seagoing ships are spending most of their time at sea
  \(\Rightarrow\) *An inland ship can be more appropriate for this concern at a first step*
Why an IWT company is involved in the EFFORTS project?

- IWT is not “directly concerned” because of relevant regulation (ADN). Shore installation have to take back cargo vapours (VOCs) when loading an inland vessel, but a few industrial installations are able to do so
  
  ⇨ *CFT may be a potential user of this technology*
What are the possible applications for IWT and port operations?

• Two main applications:
  - Transport of fuels or chemical products with tank barges
  - Cleaning out of tank barge or tankers for change of product or fire work (cutting, welding, ...)

• These main applications imply different cases:
  - Transport of liquid cargo from refineries to Hinterland
  - Transhipment
  - Or bunkering
Bunkering?

- Supplying of fuel for seagoing ships
- 100 to 4 000 tons of fuel per ship
- Done by an "inland navigation" ship
Where are VOCs from?

- Mainly due to loading chemical products in tank barge in general
- Loading fuel for bunkering or Loading chemical products for transhipment
- Air of the tank is pushed to the atmosphere if no return line to shore installation
- This air contains VOCs due to its stay in the tank
- Fuel can generate a wide range of VOCs
Where are VOCs from?

For bunkering it occurs at three steps:

- When loading the bunker tanker at the shore
- When loading the seagoing vessel in the port
- When cleaning out the tanks (when necessary)
Main advantages of the photocatalyst

In comparison with existing technologies that we can have operated by the past:

- Soft technology, no mechanical parts in motion
- No noise
- Easy to use and less dangerous than activated carbon adsorption technology
- Can be used nearly everywhere contrary to gas burning for example
- Lower cost
Expected benefits

According to BIOWIND first results, we can expect a decrease of 40 to 80 % of VOCs exhausted to the atmosphere (according the kind of VOCs). Positive impacts on:

- Health
- Safety
- Environment
- Brand image
Main difficulties for development of such an equipment

We encountered difficulties at a multiple stages:

- For dimensioning
- For designing
- And for the future installation
Dimensioning

We have to take into account different parameters from the point of view of the final user:

- VOCs concentration and type
- Free space on board
- Maximum flow rate at the VOCs return line
- Pressure drop
- Electrical power available on board
- And connection for installation

Estimating the VOCs concentration and type can be a difficulty. We need ATEX samplers to do so but they are not always transportable. So bag sampling and laboratory analysis can be necessary.
Designing

• The most difficult because of the place where the photocatalyst system is to be installed and its function
• VOCs are Explosive Atmosphere (AtEx)
• Dealing with VOCs in the marine or inland transport activity implies in general to comply with AtEx requirements.

⇒ Photocatalyst system using electrical device must be designed in consequence.

• For a bunker tanker application, AtEx area is: CE EX II 1 G / IIC T4
• In regards of the devices to be installed, material must have AtEx certification EEExd IIC T4
Designing

• First consequence: all electrical equipment have to be AtEx certified and non AtEx material must be protected by AtEx housing (type EExd IIC T4 at least).

• Second consequence: it implies a much more important volume (to fit in all equipment) which is not always in accordance with free space on board.

• AtEx is a very hard constrain for development of a new product
• Even if you have AtEx devices making the whole system, this system has to be AtEx certified too.
Installation

Regarding the activity of a bunker tanker and the procedure in use when loading the ship at shore, installation have to present all guarantees of safety, one of which is the AtEx but not only.

We have to comply with installation rules given by ADN regulation for inland ship building:

- Pressure drop calculation
- Height of gas exhaust
- AtEx class
- Corrosion
- Electric grounding
- Fitting
- …
Installation

Moreover, even if we comply with all regulation, we must have an agreement of the Safety Department of the Client, Refinery or the loading facility.

Safety Department can refuse the operation for safety reasons (AtEx approval missing, equipment seems to be defective for example or is unknown)
Next steps for Industrial Application

• AtEx approval (from company as Bureau Veritas or Lloyd Register) for the photocatalyst system
• Validation by the Refinery or Loading facility Safety Department
• Installation on barge deck or on shore (allow to using the same equipment for different ships)
• Testing with tanks cleaning out
Test performed on CFT’s Pusher

The Biowind’s photocatalyst system was used as a test on exhaust gases of the main engine.
Test performed on CFT’s Pusher

- This pusher is equipped with two engine of 1,000 HP each and is able to transport 5,000 tons of cargo. It makes a convoy of two barge for a total length of 180 meters.
Test performed on CFT’s Pusher

Test was performed during a trip between Rouen and Le Havre on the Seine river with the help of VTT (Finland) for gas analysis.
Test performed on CFT’s Pusher