

## Workshop Vigo, 1st of February 2019 Lessons learnt from a medium spill in an estuary

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#### A medium spill in an estuary (France)







### The event and first measures

- Sunday 16 March 2008 in the Loire estuary (Low tide 18h 47, neap tide coeff. 39), river flow 1000m<sup>3</sup>/s
  - 16h 20 : oil reported in the river, close to the ship loading wharf
  - 16h 45 : identification of the leakage, on the pipe at 4,8 km from the loading wharf
  - o 16h 49 : the leakage is stopped
  - o 17h : The company emergency plan and crisis unit are activated
  - o Mothy model was run
  - o FOST and Cedre immediately mobilised
- Monday 17 March, at first daylight, helicopter surveys by oil company, gendarmerie, civil security
  - to get an overview of oiling conditions and extension
  - oil slicks and sheen are spread on the water from 10 km upstream to the external part of the estuary at sea
  - Some oil already ashore, mostly on the South bank due to wind from the North
  - Crisis unit at the Prefecture is activated





## The spill

- Vol: 500 tons in the site, ~ 200 t in the estuary
- Product : IFO 380 (intermediate fuel oil)
- **Density** : 995 kg/m<sup>3</sup>
- Viscosity : 25 000 cSt at 10 °C
- Viscosity evolution after 10 days :

107 000 cSt (emulsification : 36,7 % water )







# Available model for oil slick drift forecast at the mouth of the estuary and at sea

## MOTHY model from Météo France : not designed for estuaries



Attention : document technique de prévision de dérive d'hydrocarbure, réalisé à partir d'un seul point choisi dans un ensemble complexe de nappes (observées ou non). Caution: Technical support for oil drift forecast from a single point out of a complex set of slicks (observed or not).





#### **Aerial observations on 18 March**







# Available model for oil slick drift forecast at the mouth of the estuary and at sea

#### MOTHY model efficient for drift forcast at sea



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# Available model for oil slick drift forecast in the estuary

- Hydrodynamic model : 3/4 days to run the model and get results
- In the Contingency Plan of the plant trajectory simulations were prepared in advance
- Currents were calculated for :
  - one tide amplitude
  - one river flow
  - 2 wind conditions
- Model results compared to 3 floaters trajectories dropped in 3 different locations in the estuary, every 2 hours, during a complete tide cycle.
- Four scenario were chosen (48 maps)
- A synthetic map was elaborated which shows the extreme points reached by the oil in the estuary (upstream and downstream)







Conditions de lâcher du flotteur (déversement) : Coefficient de marée 60, Q module = 850 m3/s (sans référence à la pleine mer)

Heure du lâcher de flotteur (déversement) : T0

- Lieu de lâcher de flotteur (déversement)
- Points extrêmes de la dérive du flotteur entre T0 et T0+6h
- Points extrêmes de la dérive du flotteur entre T0+6h et T0+12h
- Points extrêmes de la dérive du flotteur entre T0+12h et T0+18h
- Points extrêmes de la dérive du flotteur entre T0+18h et T0+24h

D'après l'étude n° 2 74 0202 de SOGREAH 'Modélisation numérique des déplacements de substances flottantes en Loire estuarienne'





#### Lâcher du flotteur : DONGES (appontement P5)

Figure A 4





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- Points extrêmes de la dérive du flotteur entre T0 et T0+6h
- Points extrêmes de la dérive du flotteur entre T0+6h et T0+12h
- Points extrêmes de la dérive du flotteur entre T0+12h et T0+18h
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PROJECT

Map and pictures prepared for authorities from helicopter flight observations Monday morning the 17th of March 11h 30 / 12h 30 HT – 3h to HT -2h (Coeff 44, Flow 1000 m<sup>3</sup>/s)



PROJECT

Map and pictures prepared for authorities from helicopter flight observations Monday morning the 17th of March 11h 30 / 12h 30 HT – 3h to HT -2h (Coeff 44, Flow 1000 m<sup>3</sup>/s)





### First days oiling conditions

- Due to neap tide and flow :
- oil remains on water and
- on low part of the banks









## Second phase of contamination

#### On the fourth day after the spill :

- Increase in tide (coeff 94) and flow (1300m<sup>3</sup>)
- Changes of direction and strengthening in wind
- Currents 1, 5 to 3 knots

#### As a result :

- At high tide, sudden spillover the banks, large extension of contamination
- Oil contaminates new areas,
- Oil penetrates into small creeks and overflows spreading into meadows and wetlands



MEE





## 6 days after the spill the contamination reaches almost its maximum extension in width and length (32 km )





#### Pastures contamination and monitoring

## Prefecture order : grazing ban extension and level of contamination in the flood plain (nearly 4 000 ha)







### **Operations: protection by boom deployment** :

- Try to protect sensitive areas and strategic ressources in the estuary
- Anchoring difficulties
- Strong currents
  - ➤As expected, limited efficiency



Water intake of the power station

Anchorage in a meadow





Funded by European Union Civil Protection and Humanitarian Aid

### **Operations : recovery of floating oil**

Limited operations on the river :

- OSRV Argonaute (with Thomsea trawInet)
- Mobilisation of fishing boats
- Moored Thomsea trawl nets
- Few skimming barges suited for shallow waters, none in the area
- Most floating oil was in very shallow waters close to the banks
- Low quantity recovered





#### As a result : 3 months of cleanup operations, 25 000 man day













### Lessons learnt and future developments

- Model improvement and faster transmission of forecast results (Hazrunoff project and French authorities);
- New tools as UAV (test in the frame of Hazrunoff project);
- Better adapted equipment for recovery in fast currents : since 2013 Cedre, partners and manufacturers organise tests of new equipment in the Loire estuary;
- Prototype of hovercraft for operations on mudflats and in shallow waters developped by Italian partners in the framework of a European project.







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