



# Fixed detection devices for oil slick

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# PLAN

- Goals and interests
- Detection techniques
  - Near range
  - Far range
- Specificities of fixed facilities
  - Onshore
  - Offshore
- Next challenges

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# Goals and interests

- **Risk area surveillance :**  
Early warning = shorter response time.  
Limitation of extension
  - Environmental impact
  - Costs
  - Media impact
- **Site protection :** quickly secure (e.g. : water intake)

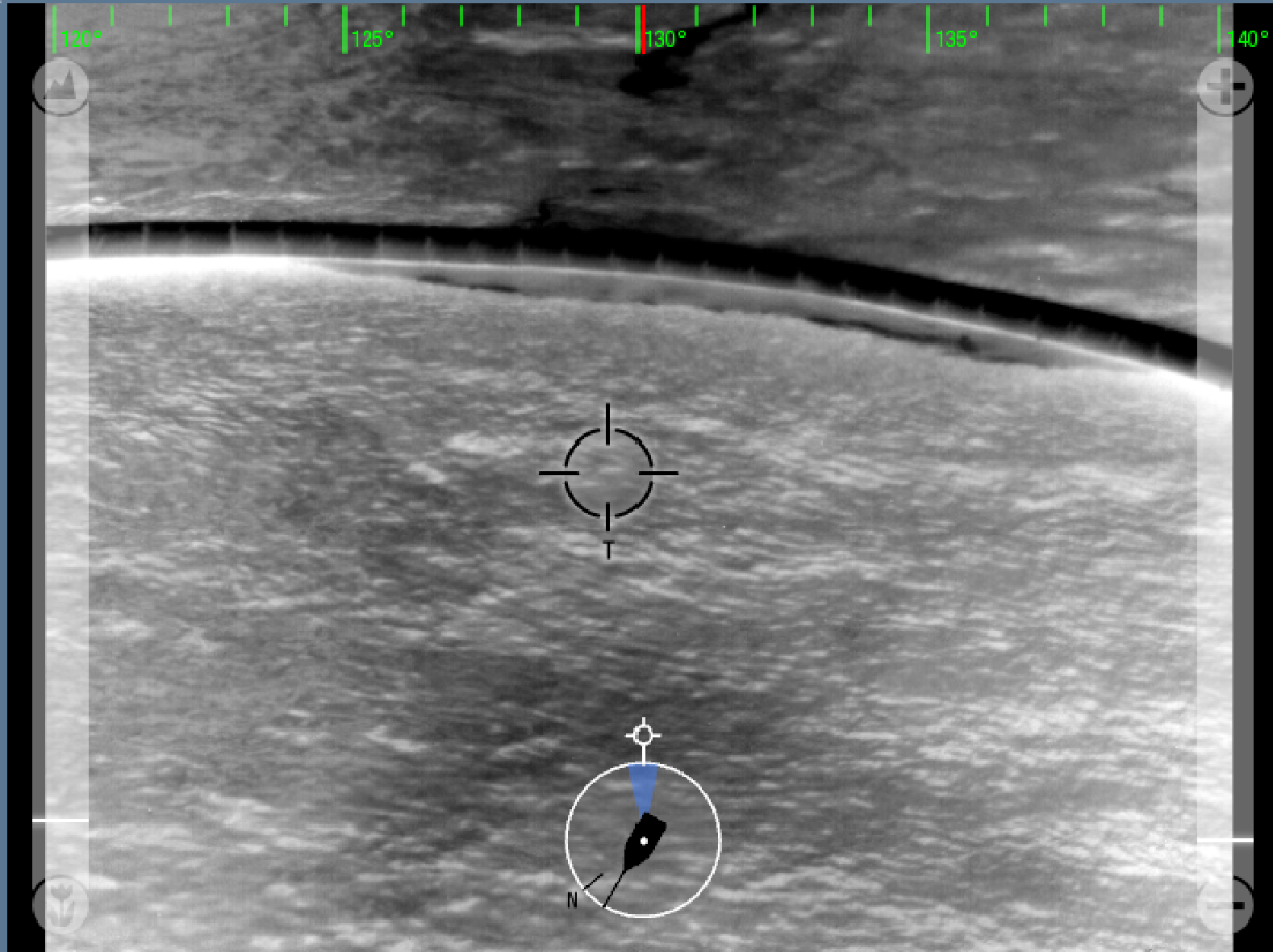
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# Goals and interests

- **Response :**
  - Thickest part of slick
  - Night and fog
  - Drift follow up and forecast
  - Geo data edit and transfer
  - Response means guidance
  - Efficiency checking

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## Example of efficiency check



*IR Camera : identification of boom leakage, source Aptomar*

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# Detection techniques

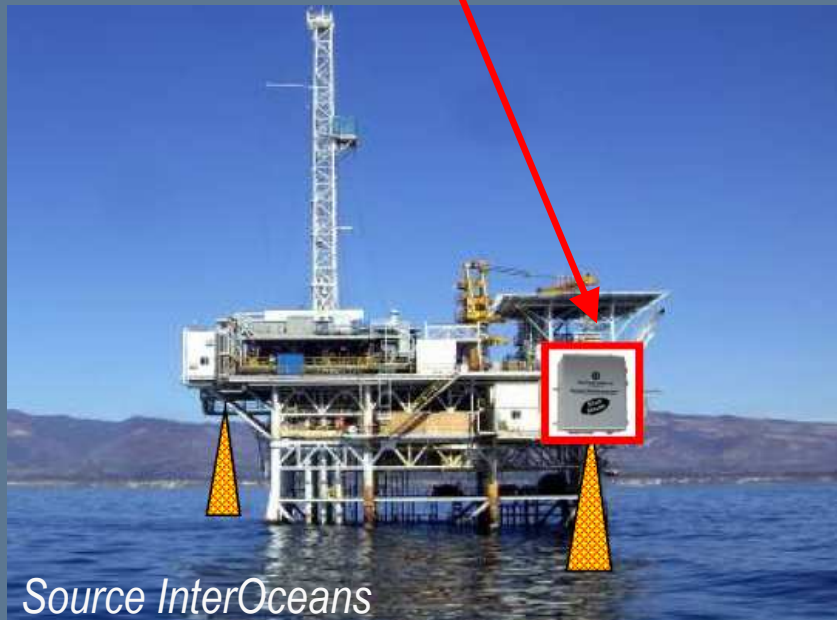
Two groups according to range

## *Near range :*

- Contact with surface
- Without contact

## *Far range :*

*some km around sensor*



Source InterOceans



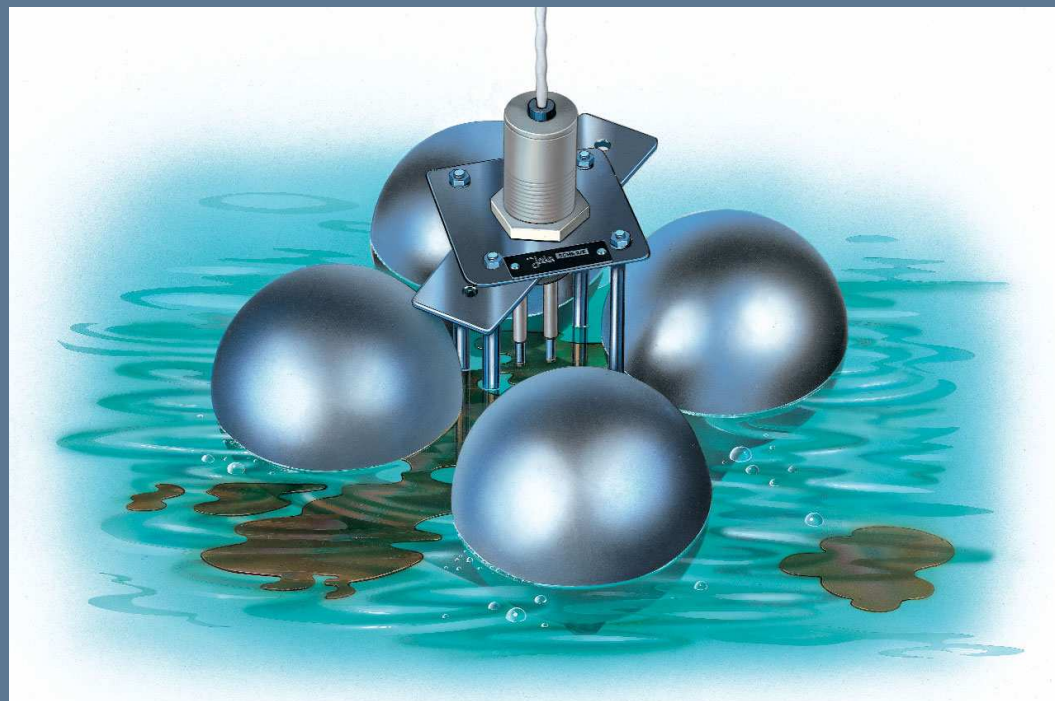
Source Miros



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# Near range Contact with surface

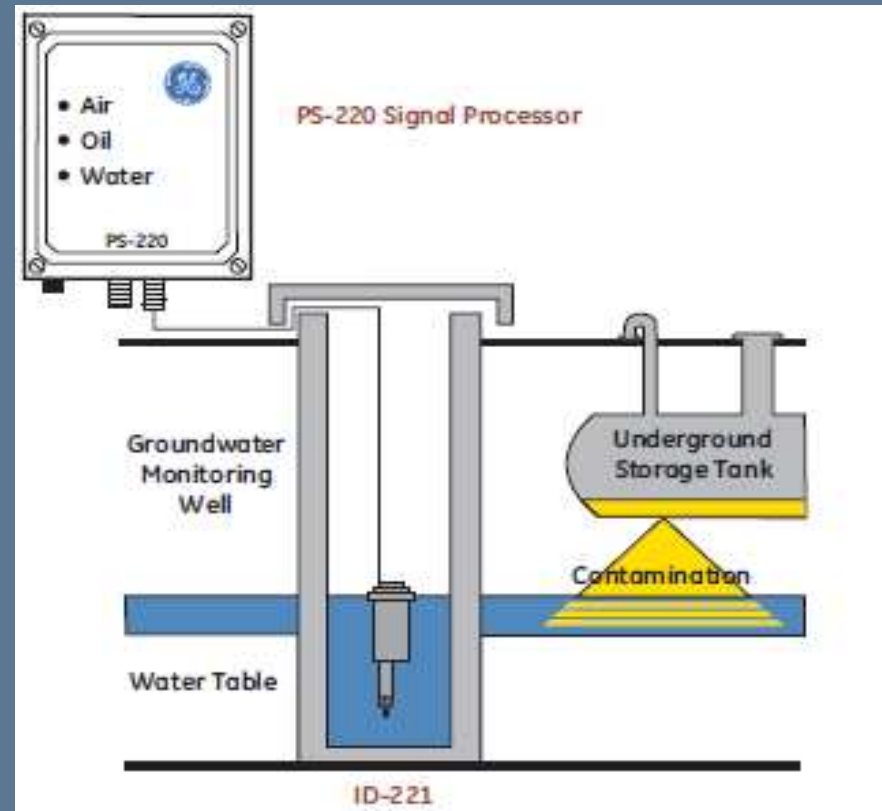
Main technologies (non exhaustive)



# Near range with contact Electromagnetic *absorption*

Water absorbs more energy than hydrocarbons  
Decreasing consumption = alarm

*Oil detector installed inside  
piezometer to monitor underground  
water quality, source GE-P&W*



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# Near range with contact Measurement electrodes

Hydrocarbons modify electric properties

- Impedance
- Resistivity
- Conductivity
- Capacitance
- 👍 Advantages : low cost
- 👎 Disadvantages : calm water needed



Résistance measurement probe,  
mounted on buoy. Source Tyco

# Near range with contact

## *Oleosensible membrane*

Polymer membrane dissolved by HC

Rupture induce electrical contact

👍 Advantages : low cost, buoy mounted available

👎 Disadvantages : single use, limited lifespan, heavy fuel senseless

*Detection device based on oleosensible membrane. Source : Nereides*



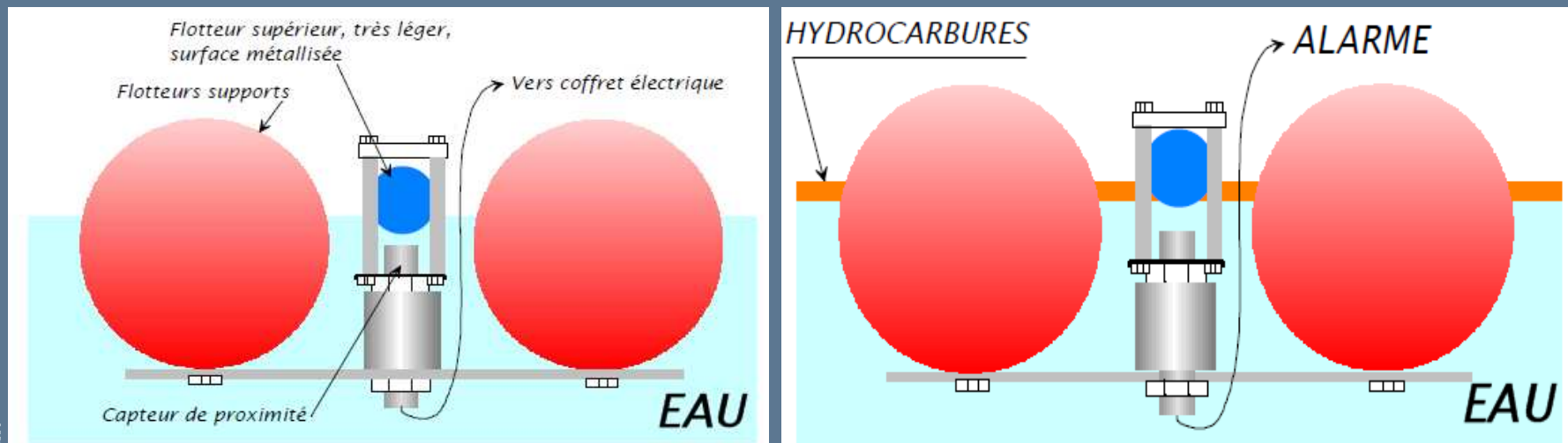
# Near range with contact

## Density comparison detection

Two buoys with different buoyancy, one activating a proximity sensor

Note : exists with oleophilic sorbent cartridge

- Disadvantages : very quiet water required, limited detection for high density HC



Density comparison detector Dim'Oil. Source : Dechetdim

# Near range without contact

Main technologies (non exhaustive)



*UV fluorosensor SlickSleuth, source InterOcean Systems*

# Near range without contact

## Reflection of constant light beam

Higher reflection on HC than on water

Reflection intensity measurement from light source

Possible sources : LED or laser

☹ Disadvantages : quiet water needed,  
fog, rain, range 3 to 5m

*Laser reflection sensor ODL 1600, source  
ISMA*



# Near range without contact

## UV fluorosensor

Excitation of HC by UV light between 300 and 400 nm

HC emit light between 450 et 600 nm

Detection of this light = HC on surface

👍 Advantage : vertical range up to 8 or 20 m (rig version)

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*SlickSleuth SS300 trials at Cedre and optics, source Cedre*

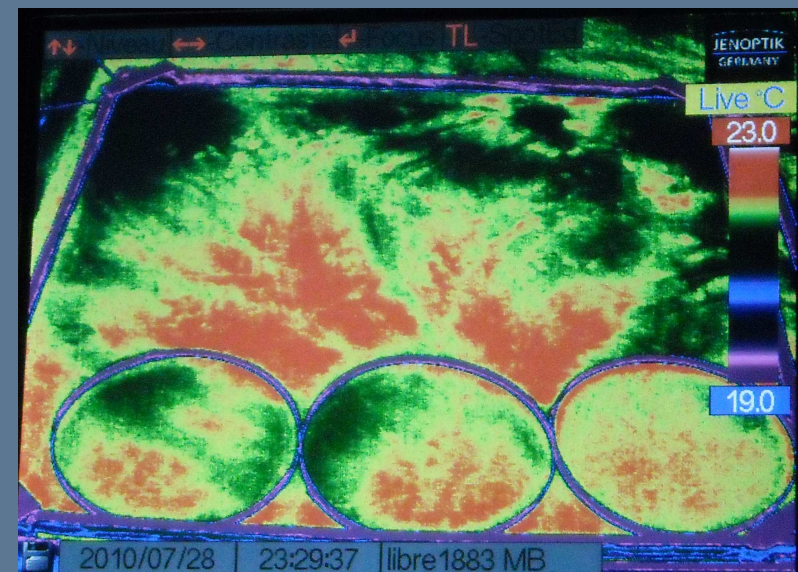
# Intermediate range dozens of meters

## IR Cam uncooled

Different thermal signature between HC and water

Simple models, relatively low cost

👍 Many advantages : night, fog, relative thickness



IR Cam Variocam trails at Cedre, source Cedre

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# Far range

## Cooled IR Cam combined with visible Cam

Better sensitivity and extended range

Interconnect with other sensors (radar, AIS)

GIS integration and data share

Other functions (SAR, Fi-Fi, etc.)



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*Securus system combining IR cam and visible cam, source Aptomar*



*Skimmer positioning, source Aptomar*

# Far range

## Radar band X

OSD radar initially dedicated to response ships

Dampering of capillarity wave detected

Possible installation on rigs or onshore

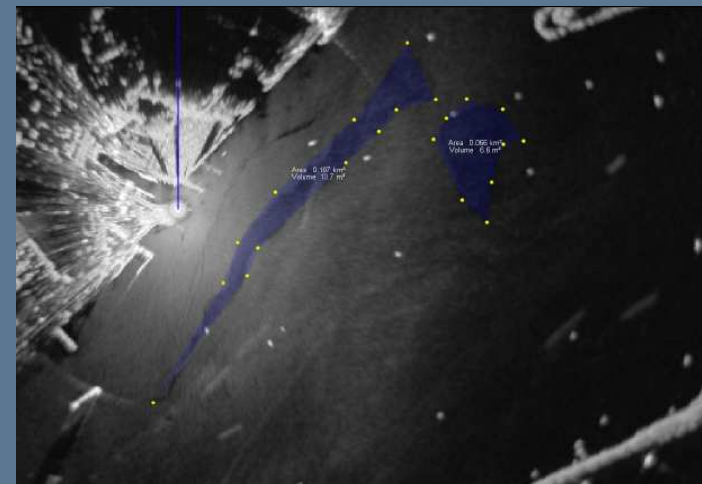
Many options : area calculation, drift follow-up, etc.

👍 Advantages : adapts on existing antenna, range up to 7km, fog senseless

👎 Disadvantages : wind needed, blind area, height, false positives, limitations onshore, no thickness



Radar antenna, source Consilium Selesmar



Radar image of a slick, source Seadarg

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# Tomorrow

## Microwave radiometer combined with radar

Passive radiometer : cosmic radiation reflectance

- 👍 Detection even without wind
- 👍 Eliminate false positives from radar
- 👍 Absolute thickness measurement → volume

R&D since 2001 (EU project), conclusive trials at sea, available in 2012



*Radiometer and radar under a same hood , source OSIS*

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# Specificities of onshore facilities

## Many constraints

### Environmental factors :

- 👉 Tide
- 👉 Seaweed
- 👉 Sediments
- 👉 Offshore winds shadow
- 👉 Complex currents
- 👉 Salt and fouling
- 👉 Fresh water mix

### Operational factors :

- 👉 Explosion risk
- 👉 Shocks

Sea Darq radar trials to monitor a jetty, source SeaDarq



# Specificities of offshore facilities

## Operational factors :

- 👍 High height often available for radar
- 👎 Explosive risk
- 👎 Sediments in process water
- 👎 Huge area fields
- 👎 Radar : blind area
  - ➔ Combination near and far range

## Environmental factors

- 👎 Heavy waves and swell

*UV fluorosensor on single buoy mooring, source InterOcean*



# Challenges to come

- Improve reliability of land based surveillance
- Combine near and far ranges
- Oil under ice detection
- Floating HNS detection

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