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Monitoring of environment protection and safety on offshore installations

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A brief overview

- E&P in Croatian offshore
- **Monitoring activities outline**
- Operator's obligation and duties
- Drill

History of exploration and production in Croatian offshore

- First exploratory wells in early 1970s
- In late 1990s start of production of gas in northern Adriatic
- More than 140 offshore wells
- 3 exploitation filed
- 20 installations (19 production, 1 compression), 21 pipelines (640 km pipelines)
- All installations still producing

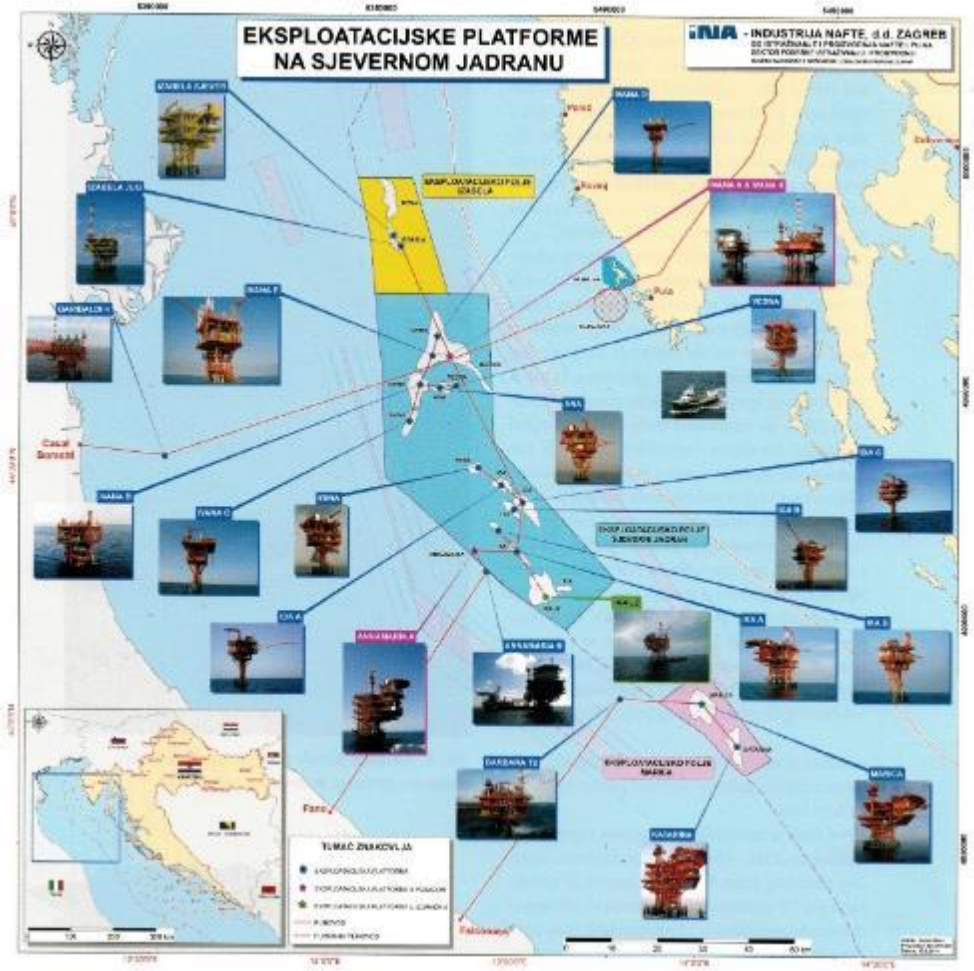

Photo: : Križan, J. 2014. Proizvodnja prirodnog plina iz hrvatskog dijela poc

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Offshore inspection - general information

- **Ministry of Environment and Energy** (Technical committees, Mining and electro inspection, Environmental inspector, construction licensee, operative licensee)
- former **Ex-Agencija**
- **Ministry of Sea, Transport and Infrastructure** & **Harbour Master Offices** Pula & Zadar (issuing of the Certificates of registry for all platforms submarine pipelines, issuing of minimum safe manning certificates for manned platforms)
- **Croatian Register of Shipping** Ministry of Construction and Physical Planning
- **Coordination** for safety in offshore exploration and exploitation of hydrocarbons

Mining inspection, electric inspection & environmental inspection

According to the application of laws and other regulations governing mining activities, exploration and production of hydrocarbons and geothermal waters, some of examples:

- safety at work
- technical compliances
- safety of people and property during mining activities
- during construction and utilization of mining object
- fulfilling the prescribed conditions of the worker
- supervision of decommissioning
- firefighting during underground activities
- obligations in connection with mining plans
- environmental inspection, fulfilling obligation

according to relevant EIAs

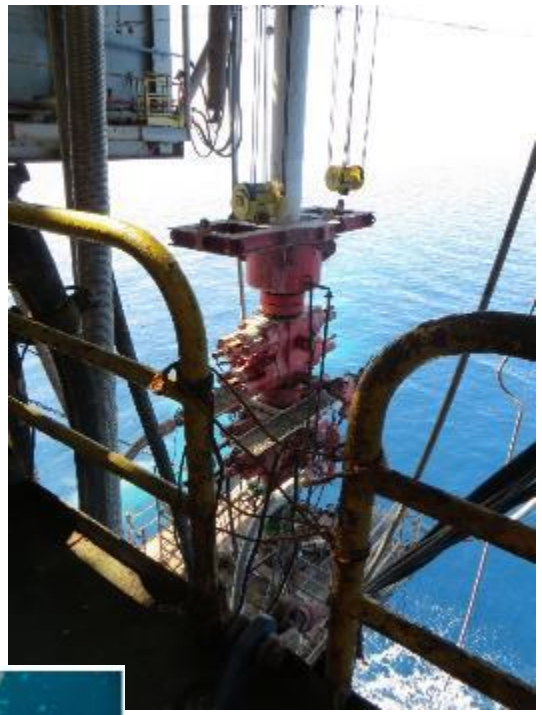

Photo: Personal Archive & Petricioli, D., Bakran –Petricioli, T., Mlinarić, D., Smital, T. 2015. Obraštaj na plinskim platformama u Jadranu kao pokazatelj stanja okoliša. Nafta i plin, vol 35., 142

Former Agency for Explosive Atmosphere Hazardous Areas (officially shortened to Ex-Agencija)

Plant inspection

Every 3 years inspection

Competence certificate for legal entity or person

Possibilities to perform activities of installing, maintenance and repair in areas at risk of explosive atmospheres

Compliance to requirement to explosion protection

- Area classification
- Electrical power equipment
- Electrical instrumentation equipment
- Electrical installation of power equipment
- Electrical installation of power instrumentation
- Non-electrical equipment and installation

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Photo : Personal Archive

CRS - Croatian Register of Shipping

PLANS

- 20 years
- Operative plan for every year for each installation

SURVEYS

- Annual
- Intermediate (within 3 months before on after the 2nd anniversary date, or within 3 months before or after the 3rd anniversary date) certificates are endorsed
- Renewal (5 years) certificates are reissued

CERTIFICATION

For <u>platforms &</u> for submarine <u>pipelines</u>:

- Fixed offshore unit safety certificate
- Oil pollution prevention certificate
- Sewage pollution prevention certificate
- Garbage pollution prevention certificate
- Certificate of test and thorough examination of the crane or hoisting device
- Pipeline system safety certificate

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Coordination for safety in offshore exploration and exploitation of hydrocarbons

- controlling and evaluating operator/owner competence and compliance
  - assessing and accepting documents (RoMHs, well notification…)
  - requesting inspections
  - participating in investigations
  - participating in safety drills
  - tripartite consultations
  - enforcement measures
- RoMH: **all major accident hazards** have been identified, probability and consequences are estimated, including environmental, meteorological and seabed limitations on safe operations, together with associated **safety and environmental critical elements**, any operation that has potential for a major accident, preparedness on uncontrolled release of formation fluids or gases

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Coordination for safety in offshore exploration and exploitation of hydrocarbons

Control measures in RoMH:

- description of equipment and arrangements to ensure well control, process safety, containment of hazardous substances
- control of safety and environmental critical elements
- description of the process-blocking system
- prevention of fire and explosion
- plans for replacement and maintenance of equipment
- protection of the workers from hazardous substances, and protection of the environment from an incipient major accident
- internal emergency response plan
- arrangements for the maintenance of control systems to prevent damage to the installation and the environment in the event that all personnel are evacuated
- operative procedures, organization in the case of an accident
- arrangement for the safety and environment management system
- corporate major accident prevention policy
- EIA studies with information on impacts, protection measures and monitoring (with monitoring results if they exist)

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Risk Assessment

- all reasonably foreseeable major accident hazards and their potential initiating events
- risk matrices
- logic models for event analysis; consequence analysis

Safety and Environment Management System

- logical and clear SEMS structure
- detailed organization structure, roles and responsibilities
- logic models for event analysis; consequence analysis

Internal emergency response plan

- clear command structure
- selection and competency of emergency team
- adequacy of response strategies
- access to muster points and temporary refuges during emergencies

Independent verification

- SECEs comprehensively identified
- contractors and third party SECEs
- usage verification results for improvement

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Decision on environmental acceptability of the project

MEASURES (selected)

- sea: processing the produced water by means of gravitational separation in the caisson until the total oil level is below 15 mg/L, when it can be discharged to sea; installing the cathodic protection system for the prevention of corrosion; when drilling, using only water-based drilling mud with low toxicity chemicals
- air: installing high efficiency flares; measuring H_2S concentration with personal detectors and regular checks of H_2S removal system on the platforms susceptible to H_2S
- waste: gathering oiled sediment, oiled water, any oiled waste, as well as sewage water, and transferring it on land; maintaining the record on produced and processed waste

cont. MONITORING PROGRAM (selected)

- produced water: monitoring the quality of the purified produced water twice a year for total oil and grease, mineral oil and ecotoxicity (toxicity on bioluminescent bacteria)
- air quality: monitoring the meteorological parameters daily/continuously; measuring the emissions of N02, NOx, CO i CO2 once a year; measuring the methane leakage with gas detectors once a year (or more often if deemed necessary)
- sea, flora and fauna: analysing biofouling on platform structure for biotoxic impacts on mussels once every five years; monitoring physical and chemical parameters in water column with CTD profiler (pressure, temperature, salinity, dissolved oxygen, fluorescence, turbidity, transparency and chlorophyll), as well as total hydrocarbons, yearlong every 5 years on several stations and depths; analysing seabed sediment with box-corers for physical and chemical parameters (granulometric, traces of metals, polycyclic aromatic hydrocarbons (PAH) and total hydrocarbons) as well as other visible features, yearlong every 5 years on several stations
- waste water: monitoring purified produced water quality for total suspended matter, mineral oils, total oils and grease twice a year; monitoring purified sewage waste water for pH, total suspended matter, BPK5, KPK, coliform bacteria, chloride, total oil and grease twice a year
- seabed subsidence: measuring seabed subsidence using the GPS antenna on platform Annamaria A, linked to similar antenna on platform Annamaria B (ENI's network)

Operator/owner/ licence holder preparedness and obligation

- Corrosion monitoring
- Underwater survey of submarine pipelines and platform structures
- Environmental monitoring
- Fire fighting inspection & testing
- Pressure safety valves inspection and calibration
- Thickness measurements of process pipelines
- Pressure vessels inspections & testing
- Safety at work
- Inspection of life-saving appliances
- Inspection of navigation aids (signalization and obstruction lightslights, fog-horn
- Radio equipment inspection
- Other items requested by Authorities and legislation

Operator's preparedness

- Periodical drills
- Different levels (scale L1 – L3), annual plan submitted to Coordination
- The last one was held in December 2018.:
  - L2 (mid-scale)
  - **Oil spill**
  - Drill purpose: thorough check of communication, identification of potential risks, the team's readiness for sudden occurrences checking and improvement of additional measures to reduce the risk
  - Dispersant Radiagreen OSD, available on platform site and on the supply vessels (200 – 600 l)

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Photo: Ina Jadran

Thank you for the attention

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Photo: Personal Archive