KATALOG USLUGA
Laboratorij istraživanja
i proizvodnje nafte i plina

CATALOGUE OF SERVICES
Exploration & Production Laboratory

E&P LAB

INA

SADRŽAJ/CONTENT

UVOD / INTRODUCTION

Laboratorij istraživanja i proizvodnje nafte i plina (LIPNP) predstavlja specifičan segment unutar sveukupnih aktivnosti INA - Industrija nafte, d.d. u području istraživanja i proizvodnje nafte i plina koje se provode na teritoriju Republike Hrvatske i izvan nje.

LIPNP ima ključnu ulogu u provođenju visokokvalitetnih laboratorijskih istraživanja stijena (jezgra i krhotine stijena) i ležišnih fluda (sirova nafta, plinski kondenzat, prirodni plin, voda). Navedena istraživanja obuhvaćaju širok spektar geoloških, geokemijskih, petrofizikalnih, termodinamičkih i fizikalno-kemijskih analiza, uključujući analize korozije uz vrhunsku ekspertnu interpretaciju i integraciju mjerenih podataka.

Osim što podržava aktivnosti INA-e, Laboratorij pruža svoje usluge i vanjskim klijentima kako iz Hrvatske, tako i iz inozemstva.

Područje rada Laboratorija IPNP obuhvaća sljedeće ključne aspekte:

- Aktivna suradnja u istraživanju i definiranju novih istražnih prostora, procesima ocjene novih projekata uključujući naftne, plinske, geotermalne i ostale energetske sustave.
- Učinkovito sudjelovanje u svim procesima i projektima geoloških i geofizičkih istraživanja uključujući i reinterpretacije, praćenje istražnih bušotina, integraciju podataka te izradu sedimentoloških i geokemijskih modela.
- Pružanje stručne podrške, razradi ležišta i proizvodnje nafte i plina, ima ključnu ulogu u optimizaciji proizvodnih procesa, povećanju rezervi nafte i plina te povećanju ekonomske vrijednosti projekata. U okviru razrade ležišta, kontinuirano pratimo razradne bušotine kroz analize svojstava stijena i fluida. Osim toga, provodimo PVT studije te se posvećujemo modeliranju procesa povećanja iscrpka nafte (EOR) kako bismo maksimizirali iskorištavanje resursa.
- U području proizvodnje i prerade nafte i plina, naša stručna podrška uključuje redovita ispitivanja svojstava ležišnih fluida te praćenje važnih aspekata kao što su akcidenti, korozija i ostale relevantne varijable. Ovim aktivnostima osiguravamo sigurnost, pouzdanost i učinkovitost proizvodnih procesa, doprinoseći dugoročnoj održivosti i uspješnosti projekata.
- Izrada laboratorijskih izvješća i studija s detaljnom interpretacijom podataka predstavlja ključnu komponentu našeg rada.
- Kontinuirano provodimo razvojno-istraživačke aktivnosti s ciljem stalnog unapređenja procesa. Uz to, posvećujemo posebnu pažnju održavanju sustava upravljanja kvalitetom kako bismo osigurali visoke standarde stručnosti i dosljednost u svim aspektima naših laboratorijskih aktivnosti.

The Exploration&Production Laboratory (E&P Lab) represents a specialised segment within the overall activities of INA - Industrija nafte, d.d. in the field of oil and gas exploration and production, carried out within the territory of the Republic of Croatia and beyond. E&P Lab plays a crucial role in performing high-quality laboratory research on rocks (cores and rock fragments) and reservoir fluids (crude oil, gas condensate, natural gas, water). These research encompass a wide range of geological, geochemical, petrophysical, thermodynamic, physical and chemical analyses, including corrosion analysis, with expert interpretation and integration of measured data.

In addition to supporting INA's activities, the Laboratory also provides its services to external clients, both from Croatia and abroad.

The scope of work of the E&P Laboratory covers the following key aspects:

- *Actively participating in the research and definition of new exploration areas, processes for evaluating new projects, including oil, gas, geothermal, and other energy systems.*
- *Effectively participating in all processes and projects of geological and geophysical research, including reinterpretations, monitoring exploration wells, integrating data, and developing sedimentological and geochemical models.*
- *Providing expert support to the reservoir development and oil and gas production plays a crucial role in optimizing production processes, increasing oil and gas reserves, and enhancing the economic value of projects. In the segment of reservoir development, we continuously monitor development wells through analyses of rock and fluid properties. Additionally, we conduct PVT studies and dedicate ourselves to modeling Enhanced Oil Recovery (EOR) processes to maximize resource utilization.*
- *In the field of oil and gas production and processing, our expert support includes regular testing of reservoir fluid properties and monitoring crucial aspects such as accidents, corrosion, and other relevant variables. Through these activities, we ensure the safety, reliability, and efficiency of production processes, contributing to the long-term sustainability and success of projects.*
- *Creating laboratory reports and studies with detailed data interpretation is a key component of our work.*
- *We continuously conduct research and development activities with the aim of ongoing process improvement. Additionally, we pay special attention to maintaining quality management systems to ensure high standards of expertise and consistency in all aspects of our laboratory activities.*

SUSTAV UPRAVLJANJA KVALITETOM / QUALITY MANAGEMENT

Stručna osposobljenost za provedbu određenih analitičkih metoda potvrđena je **Potvrdom o akreditaciji br. 1048** dobivenom od Hrvatske akreditacijske agencije slijedom norme **HRN EN ISO/IEC 17025:2017** za ispitivanja odabranih značajki kvalitete prirodnog plina, sirove nafte, mazivih ulja, vodenih otopina etilen glikola i aditiva za naftu.

Kompetentnost, sustavnost i kvaliteta pri obavljanju preuzetih poslova potvrđena je dodijeljenim certifikatima slijedom normi **ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 i ISO 50001:2018** za INA d.d.

*Expertise in the implementation of certain analytical methods was conftrmed by **Accreditation certificate No. 1048** given from the Croatian Accreditation Agency according to **HRN EN ISO/IEC 17025:2017** Standard for testing of selected characteristics of natural gas, crude oil, lubricating oils, aqueous solutions of ethylene glycol and additives for crude oil.*

*Competency, systematic approach and quality in performing tasks have been conftrmed by **ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 i ISO 50001:2018** Certificates for INA, d.d.*

Potvrda o akreditaciji
Accreditation Certificate

Ovime se utvrđuje da je
This is to recognize that

INA - INDUSTRIJA NAFTE d.d.
Istraživanje i proizvodnja nafte i plina
Razrada polja
Laboratorij istraživanja i proizvodnje nafte i plina
Lovinčićeva 4, HR-10000 Zagreb

osposobljen prema zahtjevima norme
is competent according to
HRN EN ISO/IEC 17025:2017
(ISO/IEC 17025:2017;
EN ISO/IEC 17025:2017)
za/to carry out

Ispitivanje prirodnog plina, sirove nafte, mazivih ulja, vodenih otopina etilen glikola i aditiva za naftu
Testing of natural gas, crude oil, lubricating oils, aqueous solutions of ethylene glycol and additives for crude oil

u području opisanom u prilogu koji je sastavni dio ove potvrde o akreditaciji.
for the scope described in the annex which is the constituent part of this accreditation certificate.

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Director General:
mr. sc. Mirela Zečević

HAA **Hrvatska akreditacijska agencija**
Croatian Accreditation Agency

HAA-Ob-7/7-1/izdanje/issue 6

INA-INDUSTRIJA NAFTE d.d.
Avenija Većeslava Holjevca 10, 10000 Zagreb, Hrvatska

ISO 9001:2015

INA-Industrija nafte d.d.
Istraživanje i proizvodnja nafte i plina
Avenija V. Holjevca 10, 10000 Zagreb, Hrvatska

ISO 14001:2015

INA-Industrija nafte d.d.
Istraživanje i proizvodnja nafte i plina
Avenija V. Holjevca 10, 10000 Zagreb, Hrvatska

ISO 45001:2018

Certifikat

INA – INDUSTRIJA NAFTE d.d.

ISO 50001:2018

PODRUČJE RADA / SCOPE OF WORK

Poslovne aktivnosti uključuju analize stijena i ležišnih i procesnih fluida te interpretaciju pripadajućih podataka, što obuhvaća:

- Biostratigrafske analize (kronostratigrafska odredba, fosilni sadržaj, paleoekologija, palinofacijesi, interpretacija biofacijesa i paleookoliša)
- Petrografsko-sedimentološke analize (klasifikacija stijena, mineralni sastav, strukturno-teksturne karakteristike, dijageneza, provenijencija, mikro-poroziteti, veličine i oblici zrna, sortiranost, zrelost, SEM i EDS analize, Raman mikroskopija, interpretacija litofacijesa i odredba okoliša taloženja, izrada litoloških stupova); digitalna obrada jezgri (snimanje, pohrana i dokumentacija cijelog obujma i prepiljene jezgre); analiza strukturnih elemenata jezgre (orijentacija, evidencija, pružanje i nagib slojeva, pukotina, žila)
- Geokemijske analize (organska geokemija: odredba matičnih stijena i njihove generativne sposobnosti, tip i zrelost organske tvari, organska petrografija, geokemijska karakterizacija ugljikovodika, analiza biomarkera, interpretacija naftno-geokemijskih ispitivanja, studije migracije i akumulacije ugljikovodika, rezervoarska geokemija, korelacijske studije; geokemijsko ispitivanje onečišćenja okoliša naftnim ugljikovodicima, stabilizacija/solidifikacija krhotina iz isplake; anorganska geokemija: geokemija sedimentnih, magmatskih i metamorfnih stijena, koncentracija glavnih elementa i elementa u tragovima u stijenama, talozima i tlu, teški metali)
- Petrofizikalne analize (ukupno i spektralno gama-zračenje, zasićenje fluidima, poroznost, propusnost pri sobnim uvjetima i pri povišenom tlaku, faktor formacije i indeks otpornosti, gustoća zrna stijene, analiza raspodjele veličine zrna, kapilarna svojstva, relativne propusnosti pri sobnim i ležišnim uvjetima, močivost, kompresibilnost pornog prostora, micro-CT snimanja uniskoj i visokoj rezoluciji, rekonstrukcija i obrada 3D modela, izrada mrežnog modela pornog prostora i dr.)
- EOR i posebne studije na ležišnim uvjetima: studija utiskivanja plina pod mješivim uvjetima (CO2, prirodni plin itd.), kemijske EOR metode (utiskivanje polimera, ASP), određivanje MMP tlaka, studija zavodnjavanja, određivanje relativnih propusnosti Steady-state metodom, određivanje blokade plinskog kondenzata
- Termodinamičke analize (PVT): uzorkovanje ležišnih fluida (nafta, plin, voda), kromatografske analize sastava prirodnog plina (redovite analize plina iz transportnog sustava RH), termodinamička karakterizacija i određivanje sastava ležišnih fluida pri pT uvjetima ležišta, PVT analize naftnih i plinsko-kondenzatnih sustava, Wellstream analize, separator test, EOS karakterizacija
- Karakterizacija fluida: uzorkovanje fluida; analiza sumpornih spojeva u plinovima, fizikalno-kemijske analize fluida (voda, sirova nafta, plinski kondenzat, vodena otopina etilen-glikola, trietilen glikol, nova i korištena maziva ulja motora i kompresora), reološka svojstva fluida u transportnom sustavu, djelotvornost aditiva za sirovu naftu u svrhu poboljšanja reoloških svojstava nafte; analize vode (uzorkovanje, ispitivanje pH, električne vodljivosti, saliniteta, analize aniona i metala u vodama, određivanje željeza, vodikova sulfida i ugljikova dioksida)
- Korozija: ispitivanje korozivnosti fluida na atmosferskim i povišenim pT uvjetima, ispitivanje djelotvornosti korozijskih inhibitora na atmosferskim i povišenim pT uvjetima, ispitivanje otpornosti materijala na korozijsko djelovanje, ispitivanje djelotvornosti fluida koji se upotrebljavaju za stimulaciju bušotina, korozivnost packer fluida, uzorkovanje i monitoring korozije na svim Ininim naftnim poljima, rješavanje korozijskih problema u proizvodnji, transportu i skladištenju fluida, pilot-stanica za ispitivanje utjecaja korozije i dr.

Business activities include analyses of rocks and reservoir and process fluids, as well as the interpretation of relevant data, including:

- *Biostratigraphic analyses (chronostratigraphic determination, fossil content, paleoecology, palynofacies, interpretation of biofacies and paleoenvironment)*
- *Petrographic and sedimentological analyses (classification of rocks, mineral composition, structural and textural characteristics, diagenesis, provenance, micro-porosity, grain size and shape, sorting, maturity, SEM & EDS analyses, Raman microscopy, interpretation of lithofacies and determination of depositional environments, construction of lithology columns); digital core processing (acquisition, storage and documentation of full circumference core image and slabbed core); analysis of core structural elements, fracture analysis (orientation, registration of strike and dip of bedding, fractures, veins)*
- *Geochemical analyses (organic geochemistry: source rock and generative potential, type and maturity of organic matter, organic petrography, geochemical characterisation of oil and gas, biomarker analysis, interpretation of petroleum-geochemical relationship, hydrocarbon migration and accumulation studies, reservoir geochemistry, correlation studies, geochemical investigation of environmental pollution by petroleum hydrocarbons, stabilization/solidification of petroleum drill cuttings; inorganic geochemistry: geochemistry of sedimentary, igneous and metamorphic rocks, concentration of major and trace elements in rocks, sediments and soil, heavy metals)*
- *Petrophysical analyses (total and spectral gamma ray, fluid saturation, porosity, permeability at standard and reservoir conditions, formation factor and resistivity index, grain density, grain-size distribution analysis, capillary properties, relative permeabilities, wettability, pore compressibility, Micro-CT scanning - high and low resolution, reconstruction of the 3D model and image processing, building pore network model, etc.)*
- *EOR and special core analysis: Miscible gas injection study (CO2, natural gas, etc.), chemical EOR (polymer flooding, ASP), MMP determination, waterflooding IOR, Steady-State Relative Permeability, Gas Condensate Blockage Experiment*
- *Thermodynamic (PVT) analyses: sampling of reservoir fluids (oil, gas, water), chromatographic analyses of natural gas composition (regular commercial gas analyses from the transportation system), thermodynamic characterisation and fluid composition at reservoir pT conditions, PVT analyses of oil and gas-condensate systems, Wellstream analyses, separator tests, EOS characterization*
- *Fluid characterisation: fluid sampling; analysis of sulphur compounds in gases, physical and chemical fluid analyses (water, crude oil, gas condensate, aqueous solutions of ethylene glycol, triethylene glycol, new and used engine and compressor lubricating oil), rheological fluid properties in transport system, the effectiveness of additives for crude oil in order to improve the crude oil rheological properties; water analyses (sampling, pH, electrical conductivity, salinity, analyses of anions and metals, iron determination, hydrogen-sulphide and carbon-dioxide)*
- *Corrosion: fluid corrosion testing at the atmospheric and elevated pT conditions, efficiency testing of the corrosion inhibitor at the atmospheric conditions and elevated pT conditions, material resistance testing to the corrosive activity, analysis of well stimulation fluids, packer fluid corrosion test, sampling and monitoring of corrosion on all INA's oil fields, solving corrosion problems in the production, transport and fluid storage, the pilot station for corrosion evaluation etc.*

- Izrada sedimentološkog modela: integracija i interpretacija biostratigrafskih, petrografskih i sedimentoloških istraživanja, geokemijskih, petrofizikalnih, karotažnih i seizmičkih mjerenja, podataka seizmičke i sekvencijske stratigrafije i svih drugih relevantnih dostupnih podataka u svrhu definiranja facijesa (vrijeme, sredina, mehanizam sedimentacije i dr.) i njihove distribucije (GDE) kao preduvjet rješenja geokemijskog modela
- Izrada geokemijskog modela: integracija i interpretacija podataka, BasinMod i PetroMod programsko modeliranje bazena, rekonstrukcija sedimentacijskih, erozijskih i termičkih događaja, povijest zalijeganja, kompakacija, paleobatimetrija, paleotemperatura, naftni sustav, dijagram događanja, karte zrelosti, karte generiranih ugljikovodika, karte otpuštenih ugljikovodika, volumeni.

- *Sedimentological modelling: integration and interpretation of biostratigraphic, petrographic and sedimentological studies, geochemical, petrophysical, wireline and seismic measurements, seismic stratigraphy and sequence stratigraphy data and all other relevant available data for the purpose of defining facies (time, environment, sedimentation mechanism) and their distribution (GDE) as a requirement for the geochemical modelling.*
- *Geochemical modelling: data integration and interpretation, BasinMod & PetroMod basin modelling, sedimentary, erosional and thermal reconstruction, burial history, compaction, paleobathymetry, paleotemperature, petroleum system, petroleum chart, maturity maps, generated hydrocarbon maps, expended hydrocarbon maps, volumes.*

OPĆE NAPOMENE / GENERAL REMARKS

- U laboratoriju se obavljaju ispitivanja na dostavljenim uzorcima, uključujući i one koje uzorkuju djelatnici Laboratorija IPNP.
- Rezultati ispitivanja odnose se isključivo na dostavljeni uzorak u laboratorij ili koji su izvan laboratorija ispitivali djelatnici Laboratorija IPNP.
- Prilikom dostave uzorka, potrebno je obavezno priložiti ispunjen zahtjev ili narudžbu sa sljedećim podacima: vrsta i oznaka uzorka, vrsta traženog ispitivanja, kontakt osoba za dodatne informacije te eventualni posebni dodatni zahtjevi.
- Ispitivanja provedena metodama akreditiranim prema normi HRN EN ISO/IEC 17025:2017 obilježena su oznakom:
- Nakon provedenih analiza uzorci se čuvaju sukladno propisanim radnim uputama ili postupcima.
- Potrebna količina i broj uzoraka dogovaraju se s naručiteljem, ovisno o vrsti i opsegu ispitivanja.

- *In the laboratory, the testings are performed on delivered samples, as well as on those sampled by E&P Laboratory employees.*
- *Testing results relate exclusively to the sample delivered to the laboratory or a sample that was tested outside the laboratory by E&P Laboratory employees.*
- *When delivering a sample, it is mandatory to attach a completed request or order with the following information: type and label of the sample, type of requested analyses, contact person for additional information, and any additional specific requirements.*
- *Testing performed according to methods accredited according to the HRN EN ISO/IEC 17025:2017 standard, are marked with the symbol:*
- *After performed analyses, the samples are stored according to prescribed work instructions or procedures.*
- *The required quantity and number of samples are agreed upon with the client, depending on the type and scope of the analyses.*

GEOLOGIJA
GEOLOGY

GEOLOGIJA / *GEOLOGY*
BIOSTRATIGRAFIJA / *BIOSTRATIGRAPHY*

PRIPREMA UZORAKA STIJENA I KRHOTINA STIJENA ZA MIKROSKOPSKE ANALIZE
SAMPLE PREPARATION OF CORES AND CUTTINGS FOR MICROSCOPIC ANALYSES

GB-1 Makroskopski pregled jezgrovanog intervala zbog odabira mjesta uzorkovanja (po metru)
Macroscopic inspection of the core interval for selection of sampling (per meter)

GB-2 Makroskopski pregled krhotina stijena (iz vrećica) zbog odabira intervala uzorkovanja (za svakih 100 metara bušotine)
Macroscopic inspection of rock cuttings (from bags) for selection of sampling interval (per each 100 m of the borehole)

GB-3 Uzorkovanje stijena (odabir iz vrećica s krhotinama ili iz jezgrovanog intervala)
Rock sampling (selecting from bags with rock cuttings or sampling from core interval)

GB-4 Pripremanje uzorka (čišćenje, sušenje, mljevenje)
Sample preparation (cleaning, drying, grinding)

GB-5 Izrada tankog izbruska
Thin-section preparation

GB-6 Izrada tankog izbruska iz slabo vezanih stijena u sredstvu za učvršćivanje (kanada balzam)
Thin-section preparation of poorly consolidated rocks in mounting medium (Canada balsam)

GB-7 Izrada tankog izbruska iz krhotina stijena u epoksidnoj smoli (plastil)
Thin-section preparation of rock cuttings in epoxy resin

GB-8 Izrada preparata mokrim postupkom – šlem (standardna 4 sita: 630/160/125/63 µm)
Washed sample preparation (standard 4 sieves: 630 µm, 160 µm, 125 µm, 63 µm)

GB-9 Izrada preparata mokrim postupkom – dodatno sito
Washed sample preparation - additional sieve

GB-10 Izdvajanje mikrofosila u preparate po frakciji sita – ćelije
Picking of microfossils per fraction of sieve

GB-11 Maceracija i izrada palinoloških preparata (dva preparata po uzorku)
Palynological maceration and sample preparation (two slides per sample)

PALEONTOLOGICAL ANALYSES / PALEONTOLOGICAL ANALYSES

GB-12 Makropaleonološki opis stijena (po metru)
Macropaleontologic core description (per meter)

GB-13 Makropaleontološki opis krhotina po uzorku
Macropaleontologic cuttings description per sample

GB-14 Makropaleontološka analiza fosila (odredba roda/vrste i starost)
Simple macropaleontologic analysis (genus/species, age determination)

GB-15 Mikropaleontološka analiza ćelije s interpretacijom (odredba cijele mikrofosilne zajednice, starost naslaga, paleoekologija), 4 standardna sita
Micropaleontological analysis and interpretation of washed sample (microfossil association determination, age, paleoecology), 4 standard sieves

GB-16 Mikropaleontološka analiza ćelije s interpretacijom (odredba cijele mikrofosilne zajednice, starost naslaga, paleoekologija), dodatno sito
Micropaleontological analysis and interpretation of washed sample (microfossil association determination and age, paleoecology), additional sieve

GB-17 Mikropaleontološka analiza tankog izbruska s interpretacijom (odredba cijele mikrofosilne zajednice, starost naslaga, paleoekologija)
Micropaleontological core thin-section analysis and interpretation (determination of microfossil association, age, paleoecology)

GB-18 Mikropaleontološka analiza tankog izbruska krhotina stijena u epoksidnoj smoli (plastil) s interpretacijom (odredba cijele mikrofosilne zajednice, starost naslaga, paleoekologija)
Micropaleontological analysis of rock cuttings in epoxy resin thin-section with interpretation (determination of microfossil association and age, paleoecology)

GB-19 Kvantitativna mikropaleontološka analiza ćelije (odredba cijele zajednice, izračun relativne učestalosti, izračun indeksa biološke raznovrsnosti, paleoekologija)
Quantitative micropaleontological analysis of washed sample (determination of microfossil association, calculation of relative abundance, diversity indices calculation, paleoecology)

GB-20 Hitna mikropaleontološka analiza ćelije
Urgent micropaleontological analysis of washed sample

GB-21 Hitna mikropaleontološka analiza tankog izbruska
Urgent micropaleontological thin-section analysis of core

GB-22 Hitna mikropaleontološka analiza tankog izbruska krhotina stijena u epoksidnoj smoli
Urgent micropaleontological thin-section analysis of rock cuttings in epoxy resin

GB-23 Palinološka analiza (palinofacijes i odredba starost)
Palynological analysis (palynofacies and age determination)

GB-24 Analiza ihnofosila (po metru) / Ichnofossil analysis (per meter)

GB-25 Fotomikrografija
Digital photomicrography and image processing

GB-26 Fotomakrografija
Digital photomacrography and image processing

GEOLOGIJA/GEOLOGY
PETROGRAFIJA I SEDIMENTOLOGIJA/PETROGRAPHY AND SEDIMENTOLOGY

PRIHVAT I RUKOVANJE JEZGROM PO METRU / CORE HANDLING PER METER

GPS-1 Vađenje jezgara iz cijevi (po metru)
Removal of sleeve to view core (per meter)

GPS-2 Čišćenje jezgre od isplake i označavanje (po metru)
Core pre-processing cleaning off drilling mud and marking (per meter)

GPS-3 Uzdužno piljenje jezgre (po metru)
Longitudinal core sawing (per meter)

GPS-4 Pakiranje jezgre za otpremu u postojeći sanduk (po metru)
Core packing for return shipment in existing box (per meter)

GPS-5 Pakiranje jezgre za otpremu u novi drveni sanduk (po metru)
Core packing for return shipment in new wooden box (per meter)

PRIPREMA UZORAKA STIJENA I KRHOTINA STIJENA ZA MIKROSKOPSKE ANALIZE
SAMPLE PREPARATION OF CORES AND CUTTINGS FOR MICROSCOPIC ANALYSES

GPS-6 Makroskopski pregled jezgrovanog intervala zbog odabira mjesta bušenja valjčića za petrofizikalne analize i uzorkovanja za petrografsko-sedimentološke analize (po metru)
Macroscopic inspection of the core interval for selection of petrophysical core plug drilling position and sampling for petrographical-sedimentological analyses (per meter)

GPS-7 Makroskopski pregled krhotina stijena (iz vrećica) zbog odabira intervala uzorkovanja za petrografske analize (za svakih 100 metara bušotine)
Macroscopic inspection of rock cuttings (from bags) for selection of sampling interval for petrographical analyses (per each 100 m of the borehole)

GPS-8 Uzorkovanje stijena (odabir iz vrećica s krhotinama stijena ili iz jezgrovanog intervala)
Rock sampling (selecting from bags with rock cuttings or from core interval)

GPS-9 Pripremanje uzorka (čišćenje, sušenje, mljevenje)
Sample preparation (cleaning, drying, grinding)

GPS-10 Izrada mikroskopskog preparata – tankog izbruska stijene
Thin-section preparation of cores and rocks

GPS-11 Izrada tankog izbruska iz slabo vezanih stijena u sredstvu za učvršćivanje (kanada balzam)
Thin-section prepararation of poorly consoolidated rocks in mounting medium (Canadian balsam)

GPS-12 Izrada mikroskopskog preparata - plastila iz krhotina stijene ili taloga
Thin-section preparation of rock cuttings or sludge

GPS-13 Izrada tankog izbruska stijene impregniranog obojenom smolom u vakuumu
Thin-section preparation of rock and dyed resin impregnation under vacuum

GPS-14 Test bojenja izbrusaka
Staining-tests for carbonates

GPS-15 Kalcimetrijska mjerenja (s Autokalcimetrom)
Total carbonate content (by Autocalcimeter measuring instrument)

PETROGRAFSKE ANALIZE / PETROGRAPHIC ANALYSES

GPS-16 Makroskopski opis stijena (po metru)
Macroscopic core description (per meter)

GPS-17 Makroskopski opis krhotina stijena po uzorku (izdvajanje, testovi na karbonate i dr.)
Macroscopic rock cuttings description per sample (selection, test for carbonates etc.)

GPS-18 Petrografska analiza izbruska stijene (klasifikacija stijena, mineralni sastav, strukturno-teksturne karakt. i dr.)
Thin-section petrographic analysis (classification of rocks, mineral composition, rock texture and structure etc.)

GPS-19 Petrografska analiza tankog izbruska krhotina stijena ili taloga u epoksidnoj smoli (litološka odredba, mineraloško-petrografska analiza krhotina stijena ili taloga)
Petrographic thin section analysis of rock cuttings or sludge in epoxy resin (lithological determination, mineralogical and petrographic analysis of rock cuttings or sludge)

GPS-20 Klasifikacija mikroporoziteta (odredba i odlike) petrografskog izbruska stijene impregnirane obojenom smolom
Microporosity classification (definition and criteria) of petrographic thin section of rock impregnated with dyed resin

GPS-21 Hitna petrografska analiza
Urgent petrographic analysis

GPS-22 Hitna petrografska analiza tankog izbruska krhotina stijena u smoli (plastil)
Urgent petrographic thin-section analysis of rock cuttings moulded in resin

GPS-23 Fotomikrografija
Digital photomicrography and image processing

GPS-24 Fotomakrografija
Digital photomacrography and image processing

GPS-25 Fotografiranje i obrada fotografije jezgre (po metru)
Digital core photography and image processing (per meter)

SPECIJALNE MINERALOŠKO-PETROGRAFSKE ANALIZE (MINERALI GLINA, PORNI PROSTOR, ANALIZA SLIKE)
SPECIAL MINERALOGICAL-PETROGRAPHICAL ANALYSES (CLAY MINERALS, PORE SPACE, IMAGE ANALYSIS)

GPS-26 Makroskopski pregled pod UV svjetlom (po metru)
Macroscopic UV inspection under UV light (per meter)

GPS-27 Makroskopski opis stijene pod UV svjetlom (po metru)
Macroscopic rock description under UV light (per meter)

GPS-28 Fotomakrografija pod UV svjetlom
Digital photomacrography under UV light and image processing

GPS-29 Digitalna analiza slike (fotomikrografija ili fotografija) - fazna analiza pornog prostora impregniranog obojenom epoksidnom smolom. Kvantitativna procjena površine na temelju nijansi sivog spectra ili boja
Digital Image Analysis (photomicrography or photography) – Phase analysis of pore space impregnated with blue-dyed epoxy resin. Area quantitative evaluation based on shade of gray spectrum or color phase

SEM ANALIZE / SEM ANALYSES

GPS-30 Priprema SEM-EDS uzorka (rezanje, poliranje, učvrščivanje na stalak)
SEM-EDS sample preparation (cutting, polishing, mounting on pin stub)

GPS-31 Naparivanje uzorka (Au, C)
Sample sputtering (Au, C)

GPS-32 Pretraživanje uzorka u SEM-u – mali stalak (12.5 mm)
Sample browsing in SEM – pin stub (12.5 mm)

GPS-33 Pretraživanje uzorka u SEM-u - veliki stalak (32.0 mm)
Sample browsing in SEM – pin stub (32.0 mm)

GPS-34 SEM-EDS analiza uzorka bez interpretacije
SEM-EDS analysis of sample without interpretation

GPS-35 SEM-EDS analiza s interpretacijom (kemijski i mineralni sastav, morfologija uzorka, opis pornog prostora, zrna, kristala i dr. čestica)
SEM-EDS analysis with interpretation (chemical and mineral composition, sample morphology, description of pore space, grains, crystals)

GPS-36 EDS spektrogram
EDS spectrogram

GPS-37 SEM fotomikrografija
SEM photomicrography

RAMAN MIKROSKOPIJA / RAMAN MICROSCOPY

GPS-38 Priprema uzorka za Raman mikroskopiju (učvršćivanje u smoli, rezanje, poliranje)
Raman microscopy sample preparation (moulding in resin, cutting, polishing)

GPS-39 Pretraživanje uzorka Raman mikroskopom
Sample browsing by Raman microscope

GPS-40 Optička fotomikrografija dobivena Raman mikroskopom
Optical photomicrography obtained by Raman microscope

GPS-41 Raman spektar
Raman spectrum

GPS-42 Raman mapiranje
Raman mapping

SEDIMENTOLOŠKE ANALIZE / SEDIMENTOLOGICAL ANALYSES

GPS-43 Opis sedimentnih tekstura jezgre uz skicu litološkog stupa (po metru)
Description of core sedimentary structures including core log sketch (per meter)

GPS-44 Sedimentološka interpretacija – litofacijesi, mehanizam i okoliši taloženja, vrste i tip zrna, veziva, poroznosti, dijagenetski procesi, biofacijesi, ihnofacijesi i dr. (po metru)
Sedimentological interpretation - lithofacies, depositional environment, mechanism of sedimentat., grains and cement/matrix, porosity, diagensis, biofacies, ichnofacies (per meter)

GPS-45 Izrada shematizirane skice sumarnog profila bušotine uključujući starost, okoliše, litološke jedinice, litofacijese (za svakih 100 m)
Creating schematic drawing of the well summary log including age, environment, lithological units, lithofacies (per each 100 m)

GPS-46 Izrada shematizirane skice okoliša sedimentacije
Creating schematic drawing of the sedimentary environment

GPS-47 Izrada shematizirane skice tipa i rasporeda facijesa u prostoru (GDE karta)
Creating schematic drawing of facies type and distribution (GDE map)

GPS-48 Analiza oblika zrna i izračun granulometrijskih parametara
Grain shape analysis, calculation of granulometric parameters

GPS-49 Kvantitativna modalna analiza (min. 300 zrna)
Quantitative modal analysis of thin section (min. 300 grains)

GRAFIČKI PRILOZI / GRAPHIC LOGS

GPS-50 Grafička kompjutorska izrada sumarnog stupa jezgre uz digitalizaciju krivulja gamma-ray, poroznosti i propusnosti, uključujući starost, fosilni sadržaj, litologiju, sedimentne teksture, frakture, tip pora (po metru)
Computerised core log processing including digitalised gamma-ray data, porosity and permeability, age, fossil assemblage, lithology, sedimentology structures, fractures, pore type (per meter)

GPS-51 Grafička kompjutorska obrada sumarnog profila bušotine (za svakih 100 m)
Computerised well summary log processing (per each 100 m)

GEOKEMIJA
GEOCHEMISTRY

ORGANSKA GEOKEMIJA/ORGANIC GEOCHEMISTRY

OSNOVNE METODE EVALUACIJE MATIČNIH STIJENA
SCREENING SOURCE ROCK EVALUATION METHODS

OGK-1	Makroskopski pregled jezgr. intervala i odabir mjesta uzorkovanja za geokemijske analize (po metru) Macroscopic inspection of the core int. for sample selection for geochemical analyses (per meter)
OGK-2	Uzorkovanje stijena (odabir iz vrećica s krhotinama stijena ili jezgre) Rock sampling (selecting from bags with rock cuttings or from core interval)
OGK-3	Priprema uzorka (pranje, uklanjanje onečišćenja i aditiva, usitnjavanje, litološki opis) Sample preparation (washing, removal of contaminants, pulverizing, lithological description)
OGK-4	Ekstrakcija (uklanjanje ugljikovodika za daljnje analize) Extraction (hydrocarbon removal for analyses)
OGK-5	Ubrzana ekstrakcija pod tlakom (uklanjanje ugljikovodika za daljnje analize) Accelerated extraction under pressure (hydrocarbon removal for analyses)
OGK-6	Ukupni organski ugljik (Corg) Total organic carbon (TOC)
OGK-7	Ukupni ugljik Total carbon (TC)
OGK-8	Rock-Eval piroliza Rock-Eval Pyrolysis

KARAKTERIZACIJA EKSTRAHIRANE ORGANSKE TVARI (BITUMENA)
CHARACTERIZATION OF EXTRACTABLE ORGANIC MATTER (EOM, BITUMEN)

OGK-9	Ekstrakcija i određivanje sadržaja bitumena Extraction and quantity of EOM
OGK-10	Ubrzana ekstrakcija pod tlakom i određivanje sadržaja bitumena Accelerated extraction under pressure and quantity of EOM
OGK-11	Tekućinska kromatografija (LC) bitumena (SARA analiza) Liquid chromatography (LC) of EOM (SARA analysis)
OGK-12	Plinska kromatografija (GC) bitumena Gas chromatographic (GC) analysis of EOM
OGK-13	Plinska kromatografija (GC) alkanske frakcije (C15+) bitumena Gas chromatographic (GC) analysis of saturates fraction EOM (C15+)
OGK-14	Ukupni sumpor u bitumenu (WDXRF) Total sulfur in EOM (WDXRF)
OGK-15	Tankoslojna kromatografija (TLC-FID) bitumena (SARA analiza) (IP 469) Thin-layer chromatography (TLC -FID) of EOM (SARA analysis) (IP 469)

OGK-16 Plinska kromatografija-masena spektrometrija (GC-MS) bitumena - analiza biomarkera
Gas chromatography-mas spectrometry (GC-MS) of EOM – biomarker analysis

OGK-17 Topljivost uzorka u organskom otapalu (kvalitativno)
Solubility in organic solvent (qualitatively)

KARAKTERIZACIJA KEROGENA / KEROGEN CHARACTERISATION

OGK-18 Izolacija kerogena
Kerogen isolation

OGK-19 Mikroskopsko ispitivanje (maceralni sastav i TAI)
Kerogen microscopic examination (maceral composition, TAI)

OGK-20 Refleksija vitrinita
Vitrinite reflectance

OGK-21 Ukupni sumpor u kerogenu (WDXRF)
Total sulfur in kerogen (WDXRF)

OGK-22 Fotomikrografija organske tvari
Digital photomicrography of organic matter and image processing

KARAKTERIZACIJA SIROVE NAFTE I NAFTNIH PROIZVODA
CRUDE OIL AND PETROLEUM PRODUCTS CHARACTERISATION

OGK-23 Sadržaj ukupnog sumpora u nafti (WDXRF) (ASTM D2622)
Total sulfur content in crude oil (WDXRF) (ASTM D2622)

OGK-24 Tekućinska kromatografija (LC) nafte i naftnih proizvoda (SARA analiza)
Liquid chromatography (LC) of crude oil and petroleum products (SARA analysis)

OGK-25 Plinska kromatografija (GC) nafte
Gas chromatographic (GC) analysis of whole oil

OGK-26 Plinska kromatografija (GC) gazolinske frakcije nafte
Gas chromatographic (GC) analysis of gasoline fraction of crude oil

OGK-27 Plinska kromatografija (GC) alkanske frakcije (C15+) nafte
Gas chromatographic (GC) analysis of saturates fraction (C15+) crude oil

OGK-28 Tankoslojna kromatografija (TLC-FID) nafte i naftnih proizvoda (SARA analiza) (IP 469)
Thin-layer chromatography (TLC -FID) of crude oil and petroleum products (SARA analysis) (IP 469)

OGK-29 Plinska kromatografija-masena spektrometrija (GC-MS) nafte i naftnih proizvoda - analiza biomarkera
Gas chromatography-mas spectrometry (GC-MS) of crude oil and petroleum products – biomarker analysis

OGK-30 Sadržaj ukupnog sumpora u naftnim proizvodima (WDXRF) (ASTM D2622)
Total sulfur content in petroleum products (WDXRF) (ASTM D2622)

OGK-31 Određivanje metala (21 element) u rabljenim mazivim uljima (WDXRF) (ASTM D6443)
Determination of metals (21 element) in used lubricating oils (WDXRF) (ASTM D6443)

OGK-32 Određivanje teških metala u rabljenim mazivim uljima (WDXRF) (ASTM D6443)
Determination of heavy metals in used lubricating oils (WDXRF) (ASTM D6443)

OGK-33 Određivanje sedimenata u nafti i loživom ulju metodom ekstrakcije
Sediment in crude oils and fuel oils by the extraction method

KARAKTERIZACIJA PLINSKOG KONDENZATA/ GAS CONDENSATE CHARACTERISATION

OGK-34 Sadržaj ukupnog sumpora u kondenzatu (WDXRF) (ASTM D2622)
Total sulfur content in gas condensate (WDXRF) (ASTM D2622)

OGK-35 Plinska kromatografija (GC) plinskog kondenzata
Gas chromatographic (GC) analysis of gas condensate

OGK-36 Plinska kromatografija-masena spektrometrija (GC-MS) plinskog kondenzata - analiza biomarkera
Gas chromatography-mas spectrometry (GC-MS) of gas condensate – biomarker analysis

ODREĐIVANJE KEMIJSKOG SASTAVA NEPOZNATIH UZORAKA / *CHEMICAL COMPOSITION OF UNKNOWN SAMPLES*

OGK-37 Određivanje prisutnosti metala u uzorku (EZ Scan-semikvantitativna analiza) (WDXRF)
Determination of metals in sample (EZ scan- semiquantitative analysis) (WDXRF)

OGK-38 Infracrveni (FTIR) spektar
Infrared (FTIR) spectra

OGK-39 Infracrvena spektometrijska identifikacija i analiza
Infrared spectrometric identification and analysis

GEOKEMIJSKO ISPITIVANJE ONEČIŠĆENJA OKOLIŠA NAFTNIM UGLJIKOVODICIMA
GEOCHEMICAL INVESTIGATION OF ENVIRONMENTAL POLLUTION BY PETROLEUM HYDROCARBONS

OGK-40 Ubrzana ekstrakcija pod tlakom i određivanje sadržaja ukupmih ugljikovodika
Accelerated extraction under pressure and quantity of total hydrocarbons

OGK-41 Plinska kromatografija (GC) naftnih ugljikovodika
Gas chromatographic (GC) analysis of petroleum hydrocarbons

OGK-42 Plinska kromatografija-masena spektrometrija (GC-MS) naftnih ugljikovodika - analiza biomarkera
Gas chromatography-mas spectrometry (GC-MS) of petroleum hydrocarbons – biomarker analysis

ANORGANSKA GEOKEMIJA/INORGANIC GEOCHEMISTRY

ODREĐIVANJE KEMIJSKOG SASTAVA STIJENA, TALOGA I TLA
DETERMINATION OF CHEMICAL COMPOSITION OF ROCK, SLUDGE AND SOIL

AGK-1	Određivanje metala u stijeni, talogu i tlu (EZ Scan-semikvantitativna analiza) (WDXRF) Determination of metals in rock, sludge and soil (EZ scan- semiquantitative analysis) (WDXRF)
AGK-2	Određivanje metala u stijeni, talogu i tlu (kvantitativna analiza) (WDXRF) Determination of metals in rock, sludge and soil (quantitative analysis) (WDXRF)
AGK-3	Određivanje glavnih elementa u stijenama (WDXRF) Determination of major elements in rocks (WDXRF)
AGK-4	Određivanje elemenata u tragovima u stijenama (WDXRF) Determination of trace elements in rocks (WDXRF)
AGK-5	Određivanje teških metala u stijeni, talogu i tlu (kvantitativna analiza)(WDXRF) Determination of heavy metals in rock, sludge and soil (quantitative analysis) (WDXRF)
AGK-6	Gubitak žarenjem Loss on ignition
AGK-7	Određivanje ukupnog sumpora u stijeni (WDXRF) Total sulfur content in rock (WDXRF)
AGK-8	Određivanje vlage Moisture content
AGK-9	Topljivost stijene u kiselinama na usitnjenom uzorku (po kiselini) Acid solubility test on ground sample (per acid)
AGK-10	Topljivost stijene u kiselinama na uzorku jezgre (valjčić) (po kiselini) Acid solubility test on core plug sample (per acid)

STABILIZACIJA/SOLIDIFIKACIJA KRHOTINA IZ ISPLAKE
STABILIZATION/SOLIDIFICATION OF PETROLEUM DRILL CUTTINGS

AGK-11	Određivanje sadržaja organske tvari Content of organic matter
AGK-12	Sadržaj ukupno topive tvari u vodi Content of total soluble matter in water
AGK-13	Određivanje pH vrijednosti pH value
AGK-14	Priprema stabiliziranog/solidificiranog otpada u laboratorijskim uvijetima Preparation of stabilized /solidified waste in laboratory conditions

PETROFIZIKA
CORE ANALYSES

PETROFIZIKALNE ANALIZE JEZGRE/CORE ANALYSES

PRIPREMA UZORKA / SAMPLE PREPARATION

CA-1	Bušenje, podrezivanje uzorka jezgre vodom, pakiranje i označavanje (valjčić) Drilling, trimming, packing and labelling core plug sample with water
CA-2	Bušenje, podrezivanje uzorka jezgre isplakom ili uljem, pakiranje i označavanje (valjčić) Drilling, trimming, packing and labelling core plug sample with brine or oil
CA-3	Podrezivanje krajeva uzorka jezgre vodom, isplakom ili uljem (puni promjer jezgre) Trimming core sample with water, specific brine or oil (full core diameter)
CA-4	Parafinsko konzerviranje uzorka (valjčić) Core plug preservation
CA-5	Parafinsko konzerviranje uzorka jezgre (cm jezgre) Full diameter core sample preservation (core cm)
CA-6	Određivanje prisustva ugljikovodika UV lampom na uzorku jezgre Determination of hydrocarbons using UV light on core sample
CA-7	Čišćenje uzorka jezgre standardnim otapalima Soxhlet ekstrakcijom Core plug cleaning with standard solvents - Soxhlet extraction
CA-8	Kontrolirano sušenje uzorka jezgre Controlled drying of core sample
CA-9	Priprema nekonsolidiranog uzorka za mjerenje (umotavanje u olovne tube) Unconsolidated sample preparation (sample mounting in sleeve lead)
CA-10	Priprema konsolidiranog uzorka za raspodjelu veličine zrna Sample preparation for grain size distribution analyses - consolidate sample
CA-11	Priprema nekonsolidiranog uzorka za raspodjelu veličine zrna Sample preparation for grain size distribution analyses - unconsolidated sample
CA-12	Pakiranje uzorka (valjčić ili jezgra punog promjera do 15 cm dužine) Sample packing - plug sample or full core diameter up to 15 cm length
CA-13	Filtriranje slojne vode (do 10 litara) Brine/water filtration (up to 10 liter)
CA-14	Filtriranje nafte (do 1 litre) Oil filtration (up to 1 liter)
CA-15	Filtriranje ulja (do 1 litre) Synthetic oil filtration (up to 1 liter)
CA-16	Fotografiranje i obrada fotografije jezgre ili uzorka jezgre (valjčić) Digital core photography (core or plug sample) and image processing

OSNOVNE (RUTINSKE) ANALIZE STIJENE / ROUTINE CORE ANALYSES

CA-17	Ukupna i spektralna gama jezgre i pretvorba podataka u druge digitalne formate (po metru) Total and spectral core gamma log and converting measured data to other (per meter)
CA-18	Gustoća matriksa jezgre i pretvorba mjerenih podataka u druge digitalne formate (po metru) Core matrix (bulk) density log and converting measured data to other formats (per meter)
CA-19	Propusnost profilnim permeametrom (po metru) Profile permeability measurement (per meter)
CA-20	Poroznost mjerena dušikom na uzorku jezgre (valjčić) Porosity by nitrogen injection on plug sample
CA-21	Poroznost mjerena helijem na uzorku jezgre (valjčić) Porosity by helium injection on plug sample
CA-22	Poroznost pod tlakom na uzorku jezgre (valjčić), po tlaku Porosity under overburden pressure on plug sample, per pressure point
CA-23	Propusnost za zrak na uzorku jezgre (valjčić) Air permeability on plug sample
CA-24	Propusnost pod tlakom na uzorku jezgre (valjčić), po tlaku Air permeability under overburden pressure on core plug sample, per pressure point
CA-25	Poroznost nekonsolidiranog uzorka pod tlakom, po tlaku Porosity of unconsolidated samples under overburden pressure, per pressure point
CA-26	Propusnost za zrak nekonsolidiranog uzorka pod tlakom, po tlaku Air permeability of unconsolidated samples under OB pressure, per pressure point
CA-27	Gustoća zrna stijene, po uzorku Grain density, per sample
CA-28	Raspodjela veličine zrna, po uzorku Grain size distribution, per sample

SPECIJALNE PETROFIZIKALNE ANALIZE STIJENE / *SPECIAL CORE ANALYSES*

CA-29	Kapilarni tlak - polupropusna membrana - na uzorku jezgre (valjčić), po tlaku Capillary pressure porous plate method on core plug sample, per pressure point
CA-30	Kompresibilnost pornog prostora na uzorku (valjčić) Pore volume compressibility on plug sample
CA-31	Močivost - Ammotova metoda, po uzorku Wettability - Amott method, per sample
CA-32	Faktor formacije pri sobnim uvjetima, po uzorku Formation factor at room conditions, per sample

CA-33	Indeks otpornosti pri sobnim uvjetima, po tlaku Resistivity index at room conditions, per pressure point
CA-34	Kapilarni tlak metoda centrifuge, po uzorku Capillary pressure centrifuge method, per sample
CA-35	Specifična propusnost (neagresivni fluidi) na uzorku jezgre (valjčić) Specific permeability (nonaggressive fluids) on plug sample
CA-36	Relativne propusnosti - sustav voda-nafta, plin-nafta, plin-voda (unsteady-state) korištenjem sintetičkih fluida, na uzorku jezgre (valjčić), sobni uvjeti Water-oil, gas-oil, gas-water relative permeability (unsteady state) on plug sample using sintetic fluids on room conditions
CA-37	Analiza pokrovne stijene (propusnost za vodu, tlak proboja plina), po uzorku Cap rock analysis (water permeability, threshold pressure), per sample
CA-38	Test promjene propusnosti, po uzorku jezgre (valjčić) Permeability change test, per core plug sample

MICRO-CT ANALIZE STIJENE / MICRO-CT ROCK ANALYSES

CT-1	Priprema uzorka za skeniranje (bušenje, sušenje, epoksidna smola) Preparation of the sample for scanning (drilling, drying, epoxy resin)
CT-2	Micro-CT snimanje - visoka rezolucija (<10 mikrona) Micro-CT scanning - high resolution (<10 microns)
CT-3	Micro-CT snimanje - niska rezolucija (>10 mikrona) Micro-CT scanning - low resolution (>10 microns)
CT-4	Rekonstrukcija 3D modela dobivenog iz 2D projekcija Reconstruction of the 3D model from 2D projections
CT-5	Obrada/rekonstrukcija mikro-CT digitalnog modela upotrebom 2D i 3D filtera Micro-CT image processing/reconstruction using 2D and 3D filters
CT-6	Poroznost i raspodjela veličine pora - Micro-CT analiza Porosity and pore size distribution - Micro-CT analyses
CT-7	Određivanje efektivne poroznosti / Effective porosity Determination
CT-8	Propusnost - Micro-CT analiza / Permeability - MicroCT analyses
CT-9	Faktor formacije i faktor zavojitosti pora - MicroCT analiza Formation factor and tortuosity factor - Micro-CT analyses
CT-10	Kapilarni tlak - MicroCT analiza Capilary pressure - Micro-CT analyses
CT-11	Izrada Pore Network Modela te određivanje pripadajućih petrofizikalnih svojstava Building Pore Network Model and calculation of petrophysical properties

EOR I SPECIJALNE STUDIJE PRI LEŽIŠNIM UVJETIMA
EOR AND SPECIAL CORE STUDIES AT RESERVOIR CONDITIONS

"EOR I SPECIJALNE STUDIJE PRI LEŽIŠNIM UVJETIMA
EOR AND SPECIAL CORE STUDIES AT RESERVOIR CONDITIONS"

EOR STUDIJE (UTISKIVANJE CO2, N2, METAN, PRIRODNI PLIN)
EOR STUDIES (INJECTION OF CO2, N2, METHAN, RICH OR LEAN GAS)

EOR-1	P-V odnosi smjesa: ležišni fluid i utisni plin – cijena za jednu smjesu P-V relations of reservoir fluid – injection gas mixtures – price per mixture
EOR-2	Viskoznost smjesa nafta+plin - cijena za jednu smjesu Viscosity of mixtures - price per mixture
EOR-3	EOR studija topivosti utisnutog plina - cijena za jednu izotermu EOR solubility study - price per isotherm
EOR-4	EOR studija utiskivanja vode, polimera i PAT EOR Waterflooding, Polymer and or Surfactant injection study

SPECIJALNE STUDIJE (ISPITIVANJE BLOKADE PLINSKOG KONDENZATA, RELATIVNE PROPUSNOSTI NA LEŽIŠNIM UVJETIMA)
SPECIAL STUDIES (GAS CONDENSATE BLOCKAGE STUDY, RELATIVE PERMEABILITES AT RESERVOIR CONDITIONS)

EOR-5	Ispitivanje blokade plinskog kondenzata – Steady-state relativne propusnosti (Do 500 bar, 150 °C) Gas condensate Blockage Study – Steady State relative permeabilites (Up to 500 bar, 150 °C)
EOR-6	Steady-state relativne propusnosti za sustav nafta/voda ili plin/nafta Steady-state oil/water and gas/oil relative permeability test
EOR-7	Unsteady-state relativne propusnosti za sustav nafta/voda ili plin/nafta Unsteady-state oil/water and gas/oil relative permeability test

TERMODINAMIKA/PVT

OSNOVNA ISPITIVANJA / BASIC TESTING

PVT-1	Tlačno testiranje spremnika za uzorkovanje High pressure testing of stainless containers
PVT-2	*Tlačno testiranje ventila* High pressure testing of valves
PVT-3	Provjera kvalitete separatorskih uzoraka fluida (Provjera tlaka otvaranja boce, određivanje omjera plina i kapljevine, kromatografska analiza plina i kapljevine, određivanje gustoće kapljevine) Validity check of separator samples (Cylinder opening pressure check, determination of liquid and gas volumes, GC analyses of flash liquid and gas, liquid density measurement)
PVT-4	Provjera kvalitete dubinskih uzoraka naftnih fluida (Provjera tlaka otvaranja boce, određivanje *omjera plina i kapljevine, kromatografska analiza plina i kapljevine, određivanje gustoće kapljevine)* Validity check of downhole samples of the reservoir oil (Cylinder opening pressure check, determination of liquid and gas volumes, GC analyses of flash liquid and gas, liquid density measurement)
PVT-5	Kalibracija manometara (pomoću tlačne vage) Manometer calibration (using dead weight guage)
PVT-6	Kalibracija manometara (pomoću etalonskog manometra) Pressure gauge calibration (using pre-calibrated pressure gauge)
PVT-7	Kalibracija termometara (pomoću etalonskog termometra) Thermometer calibration (using pre-calibrated thermometer)

POJEDINAČNE ANALIZE / INDIVIDUAL ANALYSIS

PVT-8	Flash test separatorske kapljevine ili dubinskog uzorka Flash test of separator liquid or downhole sample
PVT-9	P-V odnosi i flash test separatorske kapljevine pri temperaturi separacije P-V relations and flash test of separator liquid at separator temperature
PVT-10	Gustoća pri 15°C ili pri temperaturama 20°C, 25°C, 30°C digitalni mjerač gustoće Metoda: ASTM D 5002; ASTM D 4052 Density at 15°C or temperatures 20°C, 25°C, 30°C digital density meter Method: ASTM D 5002; ASTM D 4052
PVT-11	Gustoća pri p-T uvjetima – digitalni HP-HT mjerač gustoće (10-15 radnih tlakova) Density at p-T conditions – digital HP-HT density meter (10-15 pressure points)
PVT-12	Frakcijska destilacija tekućih ugljikovodika pri atmosferskom tlaku odvajanje C7+ ili C10+ frakcije Fractional distillation of stock tank liquid hydrocarbons separation of C7+ or C10+ fraction
PVT-13	Viskoznost ležišnog fluida na temperaturi ležišta (DVM HPHT elektromagnetski viskozimetar, 10-15 radnih tlakova) Viscosity of reservoir fluid at reservoir temperature (DVM HPHT electromagnetic viscometer, 10-15 pressures)

PVT-14 Viskoznost plina (izračunom iz sastava)
Viscosity of gas (calculated from composition)

PVT-15 Rekombinacija ležišnog fluida iz separatorskog plina i kapljevine
Physical recombination of reservoir fluid from separator gas and liquid

PVT-16 Separator test
Separator test

PVT-17 CCE test ležišnog fluida – test ekspanzije pri stalnom sastavu do 150°C – za jednu izotermu
CCE test of reservoir fluid – Constant Composition Expansion test up to 150°C – per isotherm

PVT-18 CCE test ležišnog fluida – test ekspanzije pri stalnom sastavu od 150oC do 200oC – za jednu izotermu
CCE test of reservoir fluid – Constant Composition Expansion test from 150oC to 200oC – per isotherm

PVT-19 CVD test ležišnog fluida - otplinjavanje pri stalnom volumenu pri temperaturi do 150°C – po tlačnom koraku
CVD test of the reservoir fluid - constant volume depletion at temperature up to 150°C – per pressure step

PVT-20 CVD test ležišnog fluida - otplinjavanje pri stalnom volumenu pri temperaturi od 150oC do 200oC – po tlačnom koraku
CVD test of the reservoir fluid - constant volume depletion at temperature from 150oC to 200oC – per pressure step

PVT-21 DL test ležišnog fluida - diferencijalno otplinjavanje pri temperaturi do 150°C – po tlačnom koraku
DL test of the reservoir fluid - differential liberation at reservoir temperature up to 150°C – per pressure step

PVT-22 DL test ležišnog fluida - diferencijalno otplinjavanje pri temperaturi od 150°C do 200°C – po tlačnom koraku
DL test of the reservoir fluid - differential liberation at temperature from 150oC to 200oC – per pressure step

PVT-23 Kromatografska analiza prirodnog plina (sastav C1-C6+; CO2; N2)
Metode: HRN ISO 6974-5; HRN ISO 6976
GC natural gas analysis (composition C1-C6+; CO2; N2)
Methods: HRN ISO 6974-5; HRN ISO 6976

PVT-24 Proširena kromatografska analiza plina (sastav C1-C14+; CO2; N2) Metoda: HRN ISO 6975
GC extended gas analysis (composition C1-C14+; CO2; N2) Method: HRN ISO 6975

PVT-25 Kromatografska analiza tekućih ugljikovodika (sastav C1-C15+) Metoda: ASTM D 3710
GC analysis of hydrocarbon liquid (composition C1-C15+) Method: ASTM D 3710

PVT-26 Analiza otopljenog prirodnog plina u vodi (kvantitativno određivanje otopljenog plina u vodi i kromatografska analiza prirodnog plina) Metode: HRN ISO 6974-5; HRN ISO 6976
Analysis of dissolved natural gas in water (quantity determ. of dissolved natural gas in water & GC analysis of natural gas) Methods: HRN ISO 6974-5; HRN ISO 6976

PVT-27 Kromatografska analiza tekućih ugljikovodika (sastav C1-C40+) Metoda: ASTM D 2887
GC analysis of hydrocarbon liquid (composition C1-C40+) Method: ASTM D 2887

PVT-28 Detaljna kromatografska analiza tekućih ugljikovodika (sastav C1-C40++ aromatski ugljikovodici BTX+EtBz) Metoda: ASTM D 2887
Detailed GC analysis of hydrocarbon liquid (composition C1-C40+ + aromatic hydrocarbons BTX+EtBz) Method: ASTM D 2887

PVT-29 Proračun toplinskih vrijednosti, gustoće, relativne gustoće i Wobbeovog broja iz sastava prirodnog plina Metoda: HRN ISO 6976
Calculation of calorific values, density, relative density and Wobbe number from natural gas composition Method: HRN ISO 6976

PVT-30 Proračun točke rosišta ugljikovodika pri zadanom tlaku i temperaturi u simulacijskom softveru IPM-PVTp
Calculation of the dew point of hydrocarbons at a given pressure and temperature in the simulation software IPM-PVTp

PVT-31 Proračun metanskog broja prirodnog plina pri zadanome sastavu; Metoda: EN 16726
Calculation of methane number of natural gas at given composition; Method: EN 16726

PVT STUDIJE / PVT STUDIES

PVT-32 Wellstream analiza (Uključuje: P-V odnosi i flash test, frakcijska destilacija, analize gustoće, viskoznosti i sastava GC/LC)
Wellstream analysis (Include: P-V relations and flash test, Fractional distillation, Analyses of density and composition GC/LC)

PVT-33 Kompletna PVT studija nafte – separatorski i dubinski uzorci
Uključuje: kontrola kvalitete uzoraka, P-V odnosi i flash test, frakcijska destilacija, rekombinacija (separatorski uzorci), separator test, CCE test, DL test, analize gustoće, viskoznosti i sastava GC/LC
Complete PVT study of oil fluids – separator and downhole samples
Include: Sample quality check, P-V relations and flash test, Fractional distillation, Recombination (separator samples), Separator test, CCE test, DL test, Analyses of viscosity, density, and composition GC/LC

PVT-34 Kompletna PVT studija plinskog kondenzata ili plina
Uključuje: kontrola kvalitete uzoraka, P-V odnosi i flash test, frakcijska destilacija, rekombinacija (separatorski uzorci), separator test, CCE test, CVD test, analizu gustoće, viskoznosti i sastava GC/LC
Complete PVT study of gas-condensate or wet gas fluids
Include: Sample quality check, P-V relations and flash test, Fractional distillation, Recombination (separator samples), Separator test, CCE test, CVD test, Analyses of viscosity, density, and composition GC/LC

PVT-35 EOS karakterizacija – izračun jednadžbe stanja (PVT softver)
EOS characterization – Equation of State calculation (PVT software)

KARAKTERIZACIJA FLUIDA
FLUID CHARACTERIZATION

KARAKTERIZACIJA FLUIDA/FLUID CHARACTERIZATION

FC-1 Analize aditiva (kompatibilnost, topivost) (Interna metoda)
Additives testing (compatibility test, solubility test) (Internal method)

FC-2 Bazni broj naftnih proizvoda (HRN ISO 3771)
Base number of petroleum products (HRN ISO 3771)

FC-3 FT-IR analiza naftnih proizvoda (ASTM E2412) (Produkti oksidacije, produkti nitracije, produkti sulfatacije, voda, čađa, očitanje aditiva, zagađenje etilen-glikolom (antifrizom), prisutnost disela, vrijednost baznog broja)
FT-IR Analyses of petroleum products (ASTM E2412) (Oxidation By-Products, Nitration By-Products, Sulfate By-Products, Water, Soot Value, Antiwear Reading, Ethylene Glycol (Antifreeze), Diesel Dilution, BN Value)

FC-4 Gustoća krutih i polukrutih bitumenoznih materijala, piknometar metoda (ASTM D70)
Density of solid and semi-solid bituminous materials, pycnometer method (ASTM D70)

FC-5 Gustoća sirove nafte (ASTM D5002; HRN EN ISO 12185) i naftnih proizvoda (ASTM D4052; HRN EN ISO 12185) određivana digitalnim densitometrom
Density of crude oil (ASTM D5002; HRN EN ISO 12185) and petroleum products (ASTM D4052; HRN EN ISO 12185) by digital density meter

FC-6 Indeks viskoznosti naftnih proizvoda (HRN ISO 2909, ASTM D2270) – računski
Viscosity index of petroleum products (HRN ISO 2909 / ASTM D2270) – calculated

FC-7 Inicijalna pH (i-pH) vrijednost naftnih proizvoda (ASTM D7946)
Initial pH (i-pH) value of petroleum products (ASTM D7946)

FC-8 Karakterizacijski faktor sirove nafte i naftnih proizvoda (UOP 375)
Characterisation factor of crude oil and petroleum products (UOP 375)

FC-9 Kiselinski broj sirove nafte i naftnih proizvoda (ASTM D664)
Acid number of crude oil and petroleum products (ASTM D664)

FC-10 Količina asfaltena u sirovoj nafti i naftnim proizvodima (ASTM D6560)
Asphaltene content in crude oil and petroleum products (ASTM D6560)

FC-11 Količina krutih parafina u sirovoj nafti (UOP 46)
Paraffin wax content in crude oil (UOP 46)

FC-12 Količina slobodne vode u sirovoj nafti (Interna metoda)
Content of free water in crude oil (Internal method)

FC-13 Količina sumporovodika, tiola i karbonil sulfida u prirodnom plinu (ISO 6326-3 i UOP 212-05) i tekućim ugljikovodicima (UOP 163-10)
Content of hydrogen sulphide, thiols and carbonyl sulfide in natural gas (ISO 6326-3 AND UOP 212-05) and liquid hydrocarbons (UOP 163-10)

FC-14 *Količina vode i sedimenata u sirovoj nafti (ASTM D4007; HRN ISO 9030) i*
naftnim proizvodima (HRN ISO 3734) metodom centrifuge
Water content and sediment in crude oil (ASTM D4007; HRN ISO 9030) and
petroleum products (HRN ISO 3734) by the centrifuge method

FC-15 Količina vode u naftnim proizvodima (Cracle test)
Water content in petroleum products (Cracle test)

FC-16 Količina vode u sirovoj nafti (ASTM D4928; HRN ISO 10337) i naftnim proizvodima
(ASTM D6304, Postupak B), kulometrija (sa sušnicom)
Water content in crude oil (ASTM D4928; HRN ISO 10337) and petroleum products
(ASTM D6304, Procedure B), Coulometry (oven)

FC-17 Količina vode u sirovoj nafti (ASTM D4006) i naftnim proizvodima (HRN ISO 3733; ASTM D95), destilacija
Water content in crude oil (ASTM D4006) and petroleum products (HRN ISO 3733; ASTM D95), distillation

FC-18 Količina željeza u rashladnim sredstvima motora (ICP) (ASTM D6130)
Iron content in engine coolants (ICP) (ASTM D6130)

FC-19 Količina željeza u trietilen glikolu (ICP) (Interna metoda)
Iron content in triethylene glycol (ICP) (Internal method)

FC-20 *Opis uzorka, voda i sedimenti - vizualno (Interna metoda)*
Sample description, water and sediments - visual (Internal method)

FC-21 *pH-vrijednost rashladnog sredstva motora (ASTM D1287), vodenih otopina (ASTM E70),*
biocida i inhibitora kamenca (Interna metoda)
pH-value of engine coolants (ASTM D1287), aqueous solutions (ASTM E70),
biocide and scale inhibitor (Internal method)

FC-22 Pjenjenje naftnih proizvoda (Interna metoda)
Foaming tendencies of petroleum products (Internal method)

FC-23 Priprema uzorka mazivog ulja za ICP analizu mikrovalnom digestijom (Interna metoda)
Sample preparation of lubricating oil for ICP analysis by microwave digestion (Internal method)

FC-24 Priprema uzorka sirove nafte/odvodnjavanje (Interna metoda)
Preparation of crude oil sample/dewatering (Internal method)

FC-25 Priprema uzorka trietilen glikola za ICP analizu (HRN EN ISO 11885)
Sample preparation of triethylene glycol for ICP analysis (HRN EN ISO 11885)

FC-26 Simultano određivanje sadržaja metala u uzorcima nerabljenog i rabljenog
mazivog ulja (ICP) (Interna metoda, ASTM D5185) - cijena po metalu
Simultaneous determination of metals in samples of unused and used
lubricating oil (ICP) (Internal method, ASTM D5185) - price per metal

FC-27 Točka paljenja naftnih proizvoda, Cleveland metoda (HRN EN ISO 2592; ASTM D92)
Flash point of petroleum products, Cleveland method (HRN EN ISO 2592; ASTM D92)

FC-28 Točka paljenja naftnih proizvoda, Pensky-Martens metoda (HRN EN ISO 2719; ASTM D93)
Flash point of petroleum products, Pensky-Martens method (HRN EN ISO 2719; ASTM D93)

FC-29 Točka smrzavanja vodenih otopina (Interna metoda)
Freezing point of aqueous solutions (Internal method)

FC-30 Točka tečenja sirove nafte (ASTM D97, ASTM D5853)
i naftnih proizvoda (HRN EN ISO 3016; ASTM D97)
Pour point of crude oil (ASTM D97, ASTM D5853)
and petroleum products (HRN EN ISO 3016; ASTM D97)

FC-31 Viskoznost sirove nafte i naftnih proizvoda po Stabingeru (ASTM D7042)
Viscosity of crude oil and petroleum products by Stabinger (ASTM D7042)

FC-32 *Viskoznost sirove nafte i naftnih proizvoda, kapilarni viskozimetar (HRN EN ISO 3104; ASTM D445)*
Viscosity of crude oil and petroleum products, capillary viscometer (HRN EN ISO 3104; ASTM D445)

FC-33 *Značajke destilacije pri atmosferskom tlaku sirove nafte i naftnih proizvoda*
(HRN ISO 3405, ASTM D86, Interna metoda)
Distillation characteristics at atmospheric pressure of crude oil and petroleum products
(HRN ISO 3405, ASTM D86, Internal method)

ANALIZA VODE
WATER ANALYSIS

ANALIZA VODE/WATER ANALYSIS

WA-1	Alkalitet vode (p-,m-) (ASTM D3875) Alkalinity in Water (p-,m-) (ASTM D3875)
WA-2	Aluminij (ICP) (HRN EN ISO 11885) Aluminium (ICP) (HRN EN ISO 11885)
WA-3	Amonij (Interna metoda) Ammonium (Internal method)
WA-4	Anionski detergenti (Interna metoda) Anionic surfactants (Internal method)
WA-5	Antimon (ICP)-hidridna tehnika(Interna metoda) Antimony (ICP)-hydride generation technique (Internal method)
WA-6	Arsen (ICP) hidridna tehnika(Interna metoda) Aresenic (ICP)-hydride generation technique (Internal method)
WA-7	Bakar (ICP) (HRN EN ISO 11885) Copper (ICP) (HRN EN ISO 11885)
WA-8	Barij (ICP) (HRN EN ISO 11885) Barium (ICP) (HRN EN ISO 11885)
WA-9	Berilij (ICP) (HRN EN ISO 11885) Beryllium (ICP) (HRN EN ISO 11885)
WA-10	Bizmut (ICP) (HRN EN ISO 11885) Bismuth(ICP) (HRN EN ISO 11885)
WA-11	Bor (ICP) (HRN EN ISO 11885) Boron (ICP) (HRN EN ISO 11885)
WA-12	Bromid (Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-B) Bromide (Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-B)
WA-13	Cink (ICP) (HRN EN ISO 11885) Zinc (ICP) (HRN EN ISO 1188:2010)
WA-14	Električna vodljivost / električni otpor (HRN EN 27888) Electric conductivity / Electric resistance(HRN EN 27888)
WA-15	Fluorid (Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-D) Fluoride (Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-D)
WA-16	Fosfor (ICP) (HRN EN ISO 11885) Phosphorus (ICP) (HRN EN ISO 11885)

WA-17 Gustoća vode (Standard Methods for the Examination of Water and Wastewater 24th Ed.,2520-C)
Density of water (Standard Methods for the Examination of Water and Wastewater 24th Ed.,2520-C)

WA-18 Hidrogenkarbonat (ASTM D3875)
Bicarbonate (ASTM D3875)

WA-19 Jodid (Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-I)
Iodide (Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-I)

WA-20 Kadmij (ICP) (HRN EN ISO 11885)
Cadmium (ICP) (HRN EN ISO 11885)

WA-21 Kalcij (ICP) (HRN EN ISO 11885)
Calcium (ICP) (HRN EN ISO 11885)

WA-22 Kalcijeva tvrdoća (Standard Methods for the Examination of Water and Wastewater 24th Ed.,2340-B)
Calcium hardness (Standard Methods for the Examination of Water and Wastewater 24th Ed.,2340-B)

WA-23 Kalij (ICP) (HRN EN ISO 11885)
Potassium (ICP) (HRN EN ISO 11885)

WA-24 Karbonat (ASTM D3875)
Carbonate (ASTM D3875)

WA-25 Kationski detergenti (Interna metoda)
Cationic surfactants (Internal metoda)

WA-26 Kisik otopljeni-Jodomoetrijska metoda (ISO 5813)
Oxygen dissolved-Iodometric method (ISO 5813)

WA-27 Klasifikacija bušotinskih voda (Palmer, Stiff)
Classification of formation water (Palmer, Stiff)

WA-28 Klorid (HRN ISO 9297; Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-C)
Chloride (HRN ISO 9297; Standard Methods for the Examination of Water and WasteWater 24th Ed.,4500-C)

WA-29 Kobalt (ICP) (HRN EN ISO 11885)
Cobalt (ICP) (HRN EN ISO 11885)

WA-30 Kositar (ICP) (HRN EN ISO 11885)
Tin (ICP) (HRN EN ISO 11885)

WA-31 Krom (ukupni) (ICP) (HRN EN ISO 11885)
Chromium (Total) (ICP) (HRN EN ISO 11885)

WA-32 Litij (ICP) (HRN EN ISO 11885)
Lithium (ICP) (HRN EN ISO 11885)

WA-33 Magnezij (ICP) (HRN EN ISO 11885)
Magnesium (ICP) (HRN EN ISO 11885)

WA-34 Magnezijeva tvrdoća (Standard Methods for the Examination of Water and Wastewater 24thEd.,2340-B)
Magnesium hardness (Standard Methods for the Examination of Water and Wastewater 24th Ed.,2340-B)

WA-35 Mangan (ICP) (HRN EN ISO 11885)
Manganese (ICP) (HRN EN ISO 11885)

WA-36 Molibden (ICP) (HRN EN ISO 11885)
Molybdenum (ICP) (HRN EN ISO 11885)

WA-37 Natrij (ICP) (HRN EN ISO 11885)
Sodium (ICP) (HRN EN ISO 11885)

WA-38 Neionski detergenti (Interna metoda)
Nonionic surfactants (Internal method)

WA-39 Nikal (ICP) (HRN EN ISO 11885)
Nickel (ICP) (HRN EN ISO 11885)

WA-40 Nitrati (Interna metoda)
Nitrate (Internal method)

WA-41 Nitriti (Interna metoda)
Nitrite (Internal method)

WA-42 Olovo (ICP) (HRN EN ISO 11885)
Lead (ICP) (HRN EN ISO 11885)

WA-43 Permanganatni indeks vode(Inetrna metoda)
Permanganate index of water (Internal method)

WA-44 pH vrijednost (HRN EN ISO 10523)
pH value (HRN EN ISO 10523)

WA-45 Salinitet (HRN ISO 9297; Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-C)
Salinity (HRN ISO 9297; Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-C)

WA-46 Selen (ICP)-hidridna tehnika(Interna metoda)
Selenium (ICP)-hydride generation technique (Internal method)

WA-47 Silicij (ICP) (HRN EN ISO 11885)
Silicon (ICP) (HRN EN ISO 11885)

WA-48 Srebro (ICP) (HRN EN ISO 11885)
Silver (ICP) (HRN EN ISO 11885)

WA-49 Stroncij (ICP) (HRN EN ISO 11885)
Strontium (ICP) (HRN EN ISO 11885)

WA-50 Suhi ostatak (105°C) (Standard Methods for the Examination of Water and Wastewater 24th Ed.,2540-B)
Total solids dried at 105°C (Standard Methods for the Examination of Water and Wastewater 24th Ed.,2540-B)

WA-51 Sulfat (Interna metoda; Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-E)
Sulphate (Internal method; Standard Methods for the Examination of Water and Wastewater 24th Ed.,4500-E)

WA-52 Sulfid (Interna metoda)
Sulfide (Internal method)

WA-53 Sumpor (ICP) (HRN EN ISO 11885)
Sulfur (ICP) (HRN EN ISO 11885)

WA-54 Sumporovodik (Interna metoda)
Hydrogen sulfid (Internal method)

WA-55 Suspendirane tvari (HRN EN 872)
Suspended solids (HRN EN 872)

WA-56 Ugljik dioksid (Standard Methods for the Examination of Water and Wastewater, 24th Ed., 4500-C)
Carbon dioxide (Standard Methods for the Examination of Water and Wastewater, 24th Ed., 4500-C)

WA-57 Ukupna tvrdoća (Ca+Mg) (Standard Methods for the Examination of Water and Wastewater 24th Ed.,2340-B)
Total hardness (Ca+Mg) (Standard Methods for the Examination of Water and Wastewater 24th Ed.,2340-B)

WA-58 Ukupna otopljena tvar
(Interna metoda, Standard Methods for the Examination of Water and Wastewater 24th Ed.,2540-C)
Total dissolved solids
(Internal mehod, Standard Methods for the Examination of Water and Wastewater 24th Ed.,2540-C)

WA-59 Vanadij (ICP) (HRN EN ISO 11885)
Vanadium (ICP) (HRN EN ISO 11885)

WA-60 Talij (ICP) (HRN EN ISO 11885)
Thallium (ICP) (HRN EN ISO 11885)

WA-61 Telur (ICP)-hidridna tehnika(Interna metoda)
Tellurium (ICP)-hydride generation technique (Internal method)

WA-62 Željezo, dvovalentno (Standard Methods for the Examination of Water and Wastewater, 24th Ed, 3500-B)
Ferrous iron (Standard Methods for the Examination of Water and Wastewater 24th Ed., 3500-B)

WA-63 Željezo trovalentno (Standard Methods for the Examination of Water and Wastewater 24th Ed, 3500-B)
Ferric iron (Standard Methods for the Examination of Water and Wastewater 24th Ed., 3500-B)

WA-64 Željezo ukupno (ICP) (HRN EN ISO 11885)
Iron, total (ICP) (HRN EN ISO 11885)

WA-65 Analiza vode (uključuje točke WA-1 do WA-64)
Water analyses (including WA-1 to WA-63)

REOLOGIJA/*RHEOLOGY*

RHEO-1 Reološka svojstva sirove nafte – rotacijska viskozimetrija pri atmosferskom tlaku i pod tlakom (krivulja viskoznosti, grafički i tablični prikaz), uzorak bez aditiva
Rheology of crude oil – rotational viscometry at atmospheric pressure and under pressure (viscosity curve, graphical and tabular view) sample without additive

RHEO-2 Reološka svojstva sirove nafte – rotacijska viskozimetrija pri atmosferskom tlaku i pod tlakom (krivulja viskoznosti, grafički i tablični prikaz), uzorak s aditivom
Rheology of crude oil – rotational viscometry at atmospheric pressure and under pressure (viscosity curve, graphical and tabular view) sample with additive

RHEO-3 Reološka svojstva sirove nafte – rotacijska viskozimetrija pri atmosferskom tlaku i pod tlakom (krivulja tečenja, grafički i tablični prikaz), uzorak bez aditiva
Rheology of crude oil – rotational viscometry at atmospheric pressure and under pressure (flow curve, graphical and tabular view) sample without additive

RHEO-4 Reološka svojstva sirove nafte – rotacijska viskozimetrija
pri atmosferskom tlaku i pod tlakom (krivulja tečenja, grafički i tablični prikaz), uzorak s aditivom
Rheology of crude oil – rotational viscometry at atmospheric pressure and under pressure (flow curve, graphical and tabular view) sample with additive

RHEO-5 Reološka svojstva sirove nafte – rotacijska viskozimetrija pri atmosferskom tlaku i pod tlakom (temperatura nastajanja krutih parafina, grafički prikaz), uzorak bez aditiva
Rheology of crude oil – rotational viscometry at atmospheric pressure and under pressure (wax appearance temp., graphical view) sample without additive

RHEO-6 *Reološka svojstva sirove nafte – rotacijska viskozimetrija pri atmosferskom tlaku* i pod tlakom (temperatura nastajanja krutih parafina, grafički prikaz), uzorak s aditivom
Rheology of crude oil – rotational viscometry at atmospheric pressure *and under pressure (wax appearance temperature, graphical view) sample with additive*

RHEO-7 Vrednovanje depresanta stiništa (1 depresant stiništa, 1 koncentracija)
dodatak od 339 HRK/45 EUR za svaku slijedeću koncentraciju (Interna metoda)
Evaluation of pour point depressant (1 pour point depressant, 1 concentration)
additional 339 HRK/45 EUR for each other concentration (Internal method)

RHEO-8 Vrednovanje deemulgatora (1 deemulgator, 1 koncentracija)
dodatak od 339 HRK/45 EUR za svaku slijedeću koncentraciju (Interna metoda)
Demulsifier evaluation (1 demulsifier, 1 concentration)

RHEO-9 Ispitivanja učinkovitosti deparafinatora (Interna metoda)
Deparaffinators efficiency testing (Internal method)

RHEO-10 Ispitivanja učinkovitosti inhibitora parafina pomoću instrumenta Cold Finger, cijena za seriju od 6 uzoraka uključujući uzorak slijepe probe (Interna metoda)
Paraffin inhibitor efficiency tests using Cold Finger instrument, priced for a series of 6 samples including a blank sample (Internal method)

KOROZIJA
CORROSION

ISPITIVANJE KOROZIJE/CORROSION TESTING

COR-1 Brzina korozije ugljičnog čelika u bušotinskoj vodi – ispitivanje korozimetrom
Corrosion rate of carbon steel in brine water - measured with Corrosimeter

COR-2 Brzina korozije ugljičnog čelika u fluidu prikupljenih na terenu gravimetrijska metoda (čelična boca)
Corrosion rate of carbon steel in the fluid from the oil field weight loss method (steel container)

COR-3 *Degradacija gume pri nižim p, T uvjetima*
Gum degradation at low p, T conditions

COR-4 Degradacija gume pri višim p, T uvjetima
Gum degradation at high p, T conditions

COR-5 *Elektrokemijsko ispitivanje pri određenim uvjetima ispitivanja,*
Linearna polarizacija (vrijeme trajanja testa 24h)*
Electrochemical testing under specific test conditions
*Linear polarization (test duration 24h)**

COR-6 Elektrokemijsko ispitivanje pri određenim uvjetima ispitivanja,
*Tafelova ekstrapolacija (vrijeme trajanja testa 24h)**
Electrochemical testing under specific test conditions
Tafel extrapolation (test duration 24h)*

COR-7 Elektrokemijsko ispitivanje pri određenim uvjetima ispitivanja,
Impedancijska spektroskopija (vrijeme trajanja testa 24h)*
Electrochemical testing under specific test conditions
Impedance spectroscopy (test duration 24h)*

COR-8 *Elektrokemijsko ispitivanje pri određenim uvjetima ispitivanja,*
Ciklička polarizacija (vrijeme trajanja testa 24h)*
Electrochemical testing under specific test conditions
*Cyclic polarization (test duration 24h)**

COR-9 Mikroskopska fotografija dijela uzorka
Microscopic photohraphy of part of the sample

COR-10 Ispitivanje korozivnosti - pri nižim p, T uvjetima (ASTM G 31)
(vrijeme ispitivanja 72h; dodatak od 226 HRK/30 EUR za svakih dodatnih 24 sata)
Corrosion testing - at low p,T conditions (ASTM G 31)
(test duration 72 h; additional cost of 226 HRK/30 EUR for each additional 24h)

COR-11 *Ispitivanje korozivnosti - pri višim p, T uvjetima (ASTM G 111)*
(vrijeme ispitivanja 72 h; dodatak od 226 HRK/30 EUR za svakih dodatnih 24 sata)
Corrosion testing at high p,T conditions (ASTM G 111)
(test duration 72 h; additional cost of 226 HRK/30 EUR for each additional 24h)

COR-12 Inhibitori korozije - određivanje koncentracije (UV/Vis)
Corrosion inhibitors – concentration determination (UV/Vis)

COR-13 Inhibitori korozije – screening - pri nižim p, T uvjetima (gravimetrija i DC)
Corrosion inhibitors – screening - at low p,T conditions (weight loss and DC)

COR-14 Inhibitori korozije – screening - pri višim p, T uvjetima (gravimetrija)
Corrosion inhibitors – screening - at high p,T conditions (weight loss method)

COR-15 Korozijska ispitivanja na terenu (ASTM G 4; NACE RP-07)
Field corrosion testing (ASTM G 4; NACE RP-07)

COR-16 Korozivnost antifriza (ASTM D 1384)
Corrosivity of antifreeze (ASTM D 1384)

COR-17 Korozivnost isplaka (ASTM G 111)
Drilling mud corrosivity (ASTM G 111)

COR-18 Korozivnost otežanih otopina $CaCl_2$, $CaBr_2$ (ASTM G 31; ASTM G 111)
Corrosivity of $CaCl_2$, $CaBr_2$ solutions (ASTM G 31; ASTM G 111)

COR-19 Korozivnost utisnih voda (ASTM G 31; ASTM G 5)
Injection water corrosivity (ASTM G 31; ASTM G 5)

COR-20 Test korozije uzorka cementnog kamena (trajanje testa 30 dana)
Corrosion test of cement sample (test duration 30 days)

COR-21 Lokalna korozija (otopina $FeCl_3$) (ASTM G 48)
Pitting and crevice corrosion test (in $FeCl_3$ solution) (ASTM G 48)

COR-22 Teorijsko predviđanje (ne)agresivnog djelovanja vode – izračun indeksa
Theoretical prediction of (non)aggressive water property – index calculation

COR-23 Naftni proizvodi - Određivanje korozivnosti na bakru - Ispitivanje na bakrenoj pločici (ISO 2160:1998)
Petroleum products - Corrosivness to copper - Copper strip test (ISO 2160:1998)

COR-24 Ispitivanje učinkovitosti inhibitora kamenca (1 inhibitor kamenca/1 koncentracija) (NACE Standard TM0374)
Test of scale inhibitor efficiency (1 scale inhibitor/1 concentration) (NACE standard TM0374)

UZORKOVANJE
SAMPLING

UZORKOVANJE/SAMPLING

S-1 Uzorkovanje prirodnog plina (Metoda: HRN ISO 10715)
Sampling of natural gas (Method: HRN ISO 10715)

S-2 Uzorkovanje separatorskog plina
Sampling of separator gas

S-3 Uzorkovanje separatorskog plinskog kondenzata
Sampling of separator gas condensate

S-4 Uzorkovanje separatorske nafte
Sampling of separator oil

S-5 Uzorkovanje stabiliziranog plinskog kondenzata
Sampling of stock-tank gas condensate

S-6 Uzorkovanje stabilizirane nafte
Sampling of stock-tank oil

S-7 Uzorkovanje separatorske vode
Sampling of separator water

S-8 Uzorkovanje prirodnog plina za određivanje količine sumporovodika, tiola i karbonil sulfida
Sampling of natural gas for determination of hydrogen sulphide, thiols and carbonyl sulfide

S-9 Uzorkovanje ostalih fluida (bušotinski i procesni fluidi)
Sampling of other fluids (well and process fluids)

S-10 Uzorkovanje vode pri p, T uvjetima
Water sampling at p,T-conditions

S-11 Uzorkovanje stijena na terenu (dnevno)
Sampling of rock (field, core storage, etc.) per day

S-12 Skladištenje (boce za uzorkovanje, uzorci stijena, jezgre)
Storing (sampling bottles, core and rock material)

S-13 Transport (otprema)
Shipment

S-14 Najam boca za uzorkovanje (po danu)
Sample bottle rent (per day)

SKLADIŠTE JEZGARA MRAMOR BRDO
MRAMOR BRDO CORE STOREHOUSE

SKLADIŠTE JEZGARA MRAMOR BRDO/MRAMOR BRDO CORE STOREHOUSE

MB-1	Transport i manipulacija jezgrom Transport and core manipulation
MB-2	Upis i pretraživanje baze podataka (uzoraka jezgara, uzoraka krhotina stijena, dokumenata…); (po stavki) Database entry and search (core samples, rock fragment samples, documents...); (per item)
MB-3	Obilazak i kontrola sigurnosno-protupožarne zaštite (čovjek/sat) Round trip - safety and fire protection control (man/hour)
MB-4	Uzorkovanje (uzoraka jezgara, uzoraka krhotina stijena, izdvajanje dokumenata…); (po uzorku, dokumentu) Sampling (selection of core samples, drill cuttings, document extraction… (per sample, document)
MB-5	Fotografiranje (digitalno fotografiranje uzoraka jezgara, krhotina stijena, dokumenata…); (po fotografiji) Photography (digital photography of core samples, drill cuttings, documents… (per photo)
MB-6	Tehnička potpora (čovjek/sat) Technical support (man/hour)

IZVJEŠĆA I STUDIJE/REPORTS AND STUDIES

R-1	Izvješće (analize bez interpretacije) Report (analyses without interpretation)
R-2	Izvješće/studija (uključuje proračune, komentare, interpretacije) Report/Study (including calculations, comments, interpretations)
LAB-1	Reinterpretacija podataka, izrada znanstveno-stručnih mišljenja, pretraživanje i korištenje baza podataka, arhiva, tehničke dokumentacije, literature i dr. Data reinterpretation, preparation of scientific and professional opinions; use of database, archives, technical documentation, literature, etc.

KRATICE / *ABBREVIATIONS*

API	American Petroleum Institute
ASP	Alkaline-surfactant-polymer
ASTM	American Society for Testing and Materials
BTX	benzen, toluen, ksilen
CCE	Constant Composition Expansion
CVD	Constant Volume Depletion
DC	Direct Current
DIN	German standard
DL	Differential Liberation
EDS	Energy dispersive spectrometry
EN	Europska norma (European standard)
EOM	Extractable organic matter
EOR	Enhanced Oil Recovery
FTIR	Fourier transform infrared spectroscopy
GC	Gas Chromatography
GC-MS	Gas chromatography-mass spectrometry
GDE	Gross depositional environment
HRN	Hrvatska Norma (Croatian standard)
IEC	International Electrotechnical Commission
IOR	Improved Oil Recovery
ISO	International Organization for Standardization
LC	Liquid Chromatography
MMP	Minimum Miscibility Pressure
NACE	National Association of Corrosion
OHSAS	Occupational Health and Safety Assessment Series
p, T	Tlak i temperatura
PAT	Površinsko aktivna tvar
Pb	Bubble Point Pressure
PDV	Porez na dodanu vrijednost
PVT	Pressure Volume Temperature
SEM	Scanning Electron Microscopy
TAI	Thermal Alteration Index
TC	Total carbon
TLC	Thin-layer chromatography
TOC	Total Organic Carbon
UOP	Universal Oil Product
UV/Vis	Ultraviolet/Visible
WDXRF	Wavelength- Dispersive X- Ray Fluorescence

INA-Industrija nafte, d.d.
Laboratorij istraživanja i proizvodnje nafte i plina
Exploration&Production Laboratory
Lovinčićeva ulica 4
10 000 Zagreb
Hrvatska
e-mail: upstream.laboratory@ina.hr

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E&P LAB
INA