



EXPLORATION & PRODUCTION

**INA**

# WHO WE ARE

INA is a medium-sized European oil company, with a leading role in Croatian oil business and a strong position in the region. INA Group is comprised of several companies completely or partially owned by INA.

INA is committed to doing business in accordance with sustainable development, which means that it strives towards integrating economic, environmental and social factors in its daily operations. Trying to make energy available, INA wants to be a driver of social and economic development, taking care of people and the environment while fostering responsible business operations and local partnerships.



**INA**



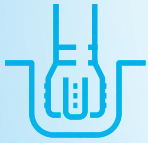
Data shown for 2020 year-end, unless otherwise noted.

# INA'S EXPERIENCE IN EXPLORATION & PRODUCTION

INA's success is based on its experienced, educated, agile & creative employees. Understanding that people are the greatest value determines our business conduct, organizational and management structure and work processes.



# EXPERTISE GAINED IN CROATIA



Experts in exploring complex basins



Mature fields management



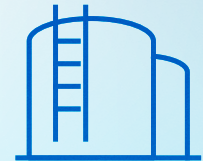
JV experience, shallow offshore operatorship

## Production



**29.5**  
Mboe/d

## 2P Reserves



**95**  
MMboe

## EBITDA & CAPEX



EBITDA: **153** USD mn  
CAPEX: **67** USD mn

Know-how is a catalyst for technological change and improvement of products, processes and services. We encourage continuous development of competences and internal knowledge transfer.

# ASSETS

## DOMESTIC ASSETS

**Activities**  
in Croatia since 1952  
(Naftaplín)



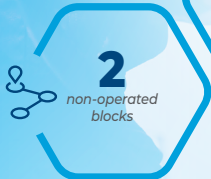
# INTERNATIONAL ASSETS

## Activities

in Egypt since 1989  
and in Angola since  
1981



Egypt



Angola

# OPERATING CYCLE

INA's E&P operating cycle is supported by key expert disciplines.

seismic processing



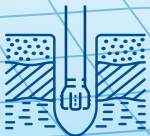
geology and geophysics

rock and fluid analysis



petrophysics

reservoir engineering



drilling and completion

production systems engineering





# 1) SEISMIC PROCESSING

## Acquisition planning

- Geophysical survey design
- Onshore and offshore operations supervision & QC

## Data processing

- Land, marine, 2D, 3D, time, depth
- Highly complex and low S/N ratio areas
- Pre-stack & post-stack merge of different vintages
- Analogous to digital conversion (scanning and vectorising)
- VSP data processing

## Experience

- Pannonian Basin (Croatia and Hungary), Dinarides, Adriatic Sea, Syria, Kurdistan, Pakistan, Albania, Namibia, Iran, Egypt, North Sea

## RECENT HIGHLIGHTS

- 750 km<sup>2</sup> of 3D data acquired and PSTM & PSDM processed in Croatia



# 2) EXPLORATION GEOLOGY AND GEOPHYSICS

## PLAY-BASED EXPLORATION METHODOLOGY

### Regional tectono-stratigraphic interpretation

- Structural analysis and seismic interpretation
- Well correlation and stratigraphic modeling
- Basin analysis
- Play and prospect evaluation
- Resources and risk assessment
- Play fairway assessment and CRS maps

### Experience

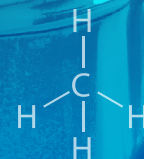
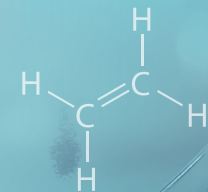
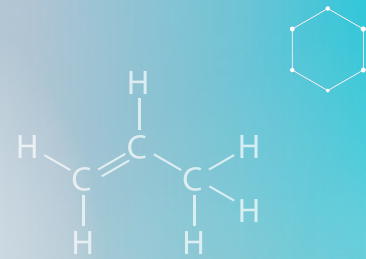
- Pannonian Basin (Croatia and Hungary), Dinarides, Adriatic Sea, Syria, Kurdistan, Pakistan, Albania, Namibia, Iran, Egypt, North Sea

## RESERVOIR GEOLOGY AND GEOPHYSICS

- Attribute analysis
- Well correlation
- Fault correlation
- Fault modeling
- Pillar gridding
- Zonation and layering
- Facies modeling
- Petrophysical modeling
- 3D Structural modeling
- Volume calculation
- Well design

## INTERPRETATION PLATFORMS

- Halliburton and Schlumberger software platforms used in exploration and field development workflows



# 3) ROCK AND FLUID ANALYSIS

- Laboratory analyses of rocks and reservoir fluids, data interpretation, preparation of reports and studies
- Petroleum and basin modeling

## Lab Geology and Geochemistry

- Biostratigraphy
- Petrography & sedimentology
- Geochemistry analytics & modeling
- Sedimentological modeling

## R&D initiatives

- Extreme conditions coreflood project
- SCAL and EOR analysis
- Measuring condensate blockage and relative permeability

## Lab Petrophysics and Thermodynamics

- Petrophysics
- PVT and EOR modeling
- Fluid characterization and corrosion testing

**HRN EN ISO/IEC 17025 : 2007**

Partners: universities, scientific research institutions and external clients

# 4) PETROPHYSICS

## WELL LOG INTERPRETATION

### Open hole

- Borehole imaging, stress regimes, geomechanical analysis, wellbore stability
- Sandstones, carbonates, thin layer, complex lithology
- Geosteering
- Sedimentology

### Cased hole

- C/O, sigma, cement bond, well integrity, production-injection profile

### Software Packages

- Open hole (GEOLOG, TECHLOG, IP, EXPRESS)
- Cased hole (PLATO, FRS-TMD3D, CIT, QHW-PNN)

## MUD LOGGING – FULL SCALE WELL SITE GEOLOGY

### Mud logging, drilling assistance & control services

- Onshore and offshore mud logging unit

### Software packages

- PEN-LAB

## DATA MANAGEMENT

- Digitalization of hard copies and scans (documents, reports, well logs, master logs...)
- Corporate log database for petrophysicists (ascii, las, dlist, db, pdf, tiff)
- Archiving technical well documentation

### Software packages

- Petris Recall, PWE, DSIS, Neurolog



## 5) RESERVOIR ENGINEERING

- Geological models with parameters distribution
- Dynamic modeling – material balance and/or simulation
- Result analysis, history matching and fine tuning
- OHIP evaluation and reserves estimation
- Integrated asset model
- Production optimization
- New infill well locations / workovers
- Production forecast and sensitivities
- Well test design and analysis
- Field development plan preparation

# 6) DRILLING AND COMPLETION

## Croatia Onshore

- Drilling depleted sandstone & carbonate reservoirs
- HP-HT deep gas-condensate D&C
- Slim hole RE HT-LP D&C
- Advanced acid jobs and HF stimulations

## Croatia Offshore

- Extended-reach drilling / RSS / hydraulics
- Batch mode D&C of 6 deviated wells from one jacket
- Frac&pack or high-rate water pack technique for high permeability sand layers/thin layers
- Dual 2 3/8" completion design

## Syria Onshore

- Drilling fractured carbonates and cementing liner
- Drilling creeping HP salt zones/high collapse casing

## Egypt Onshore

- Drilling sloughing shale zones/cementing
- Deep exploratory drilling

## Albania Onshore

- Drilling through HP zones (sandstone/shale)



## Software skills

- Landmark Drilling Package (Compass, Casing Seat, Stress Check, Well Plan)
- Mayer Stimulation Package (F&P, HF)

# 7) PRODUCTION SYSTEMS ENGINEERING

## Production Operations Engineering

- Nodal system analysis & integrated production modeling
- Completion systems engineering
- Artificial lift systems engineering and optimization
- Flow assurance and well production optimization
- Production loss management
- Production Management Framework concept
- Digital Oilfield concept

## Oil and Gas Facilities Engineering

- Gathering and transport systems engineering and optimization
- Flow assurance
- Gas treatment and processing engineering and optimization
- Liquid and gas measurement
- Process safety management
- Integrated process modeling

## Production Chemistry

- Paraffin waxes and asphaltenes
- Emulsions
- Corrosion
- Scale
- Microbiological fouling and corrosion
- Gas hydrates



# MATURE ASSETS MANAGEMENT

## CROATIA'S OIL FIELDS

- 38 oil fields in production, 45 years-old on average, highly mature and depleted
- 90% of oil produced from 14 fields
- Production brought back to levels of 12 years ago
- Continuous optimization to maintain production plateau
- Possibilities of exploiting depleted fields for geothermal and CCS projects

## WELL PERFORMANCE IMPROVEMENT

- Decreasing constraints
- Artificial lift optimization
- Well workovers, stimulations and sand control
- Re-perforating
- Installing wellhead compressors
- Improving flow assurance with chemicals

### Croatia Onshore Oil Production





## RESERVOIR PERFORMANCE IMPROVEMENT

- Performing 3D seismic
- Updating and revising geological settings
- Identifying bypassed oil and gas
- Infill & sidetrack well drilling
- Opening idle reservoir intervals
- Improving reservoir pressure support and water control



1,000

**OIL WELLS IN  
PORTFOLIO**



180+

**USD MN  
INVESTED**

SINCE 2014



500+

**WELL WORKOVERS  
& STIMULATIONS**

SINCE 2014

## IMPLEMENTING EOR METHODS

- EOR in progress on two fields
- Screening of other Croatia onshore fields identified potential for implementing EOR
- Launching pilot EOR projects on prospective fields

# ENHANCED OIL RECOVERY

## IVANIĆ & ŽUTICA OIL FIELDS

- Large highly depleted oil fields in production since the 1960s
- Using high CO<sub>2</sub> content onshore gas fields as a natural CO<sub>2</sub> source
- Water-alternating-gas injection process running since 2014 at a rate of 600,000 m<sup>3</sup>/day
- No HSE incidents despite operating in an urban area – safety is top priority

### Results

- Incremental production surpassed 1.6 MMboe
- Ivanić field production more than doubled in 6 years
- Žutica North field production increased 4 times in 5 years

### Expansion

- Expecting to expand the complete CO<sub>2</sub> infrastructure to neighboring fields with the possibility of creating a CO<sub>2</sub> hub





200

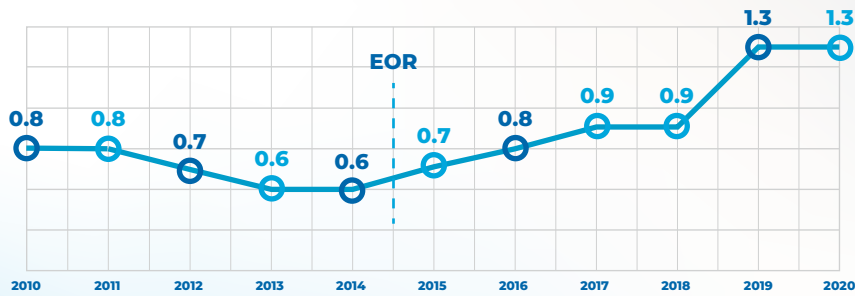
USD MN  
INVESTED



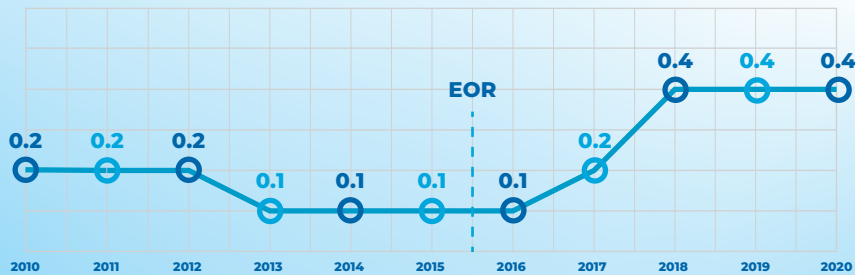
1.6+

MMboe INCREMENTAL  
PRODUCED

### Ivanić production (Mboe/d)



### Žutica North production (Mboe/d)



# PROCESS SAFETY MANAGEMENT

System directed towards preventing serious process-related incidents that might affect plant personnel, off-site communities, the environment and result in significant loss of property, business continuity and reputation. Implementation started in 2015.



# HSE & SUSTAINABLE DEVELOPMENT

- Safety-first approach to all operations – people are at the centre of everything we do
- Successful operations without any fatalities or major injuries in decades
- Compliance with environment-related laws throughout our operations
- Successfully dealing with the harsh environment on onshore gas fields (CO<sub>2</sub>, H<sub>2</sub>S, Hg and HP/HT conditions) at the Molve gas treatment plant
- Improving HSE performance by operating PDCA cycles (Plan, Do, Check, and Act) based on the HSE management system conforming to international standards
- Committed to delivering positive outcomes in the communities where we operate
- The ongoing CO<sub>2</sub> EOR project is an example of our efforts to mitigate global warming

## CERTIFICATES AND STANDARDS

- ISO 9001 : 2015
- ISO 14001 : 2014
- DIN EN ISO 5001 : 2011
- ISO 45001:2018



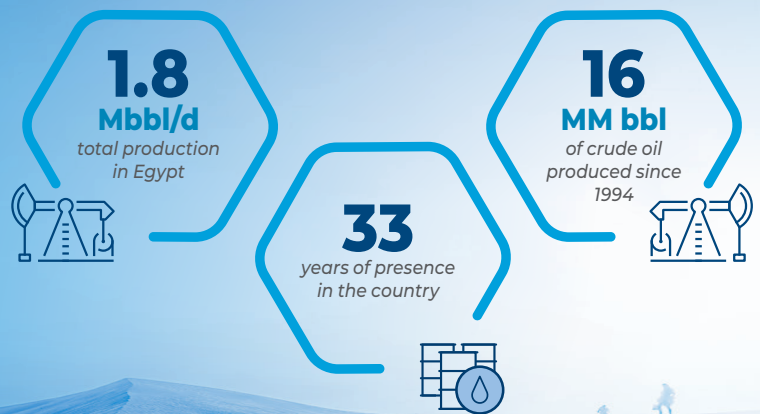
# INA'S EXPLORATION AND PRODUCTION ACTIVITIES IN EGYPT

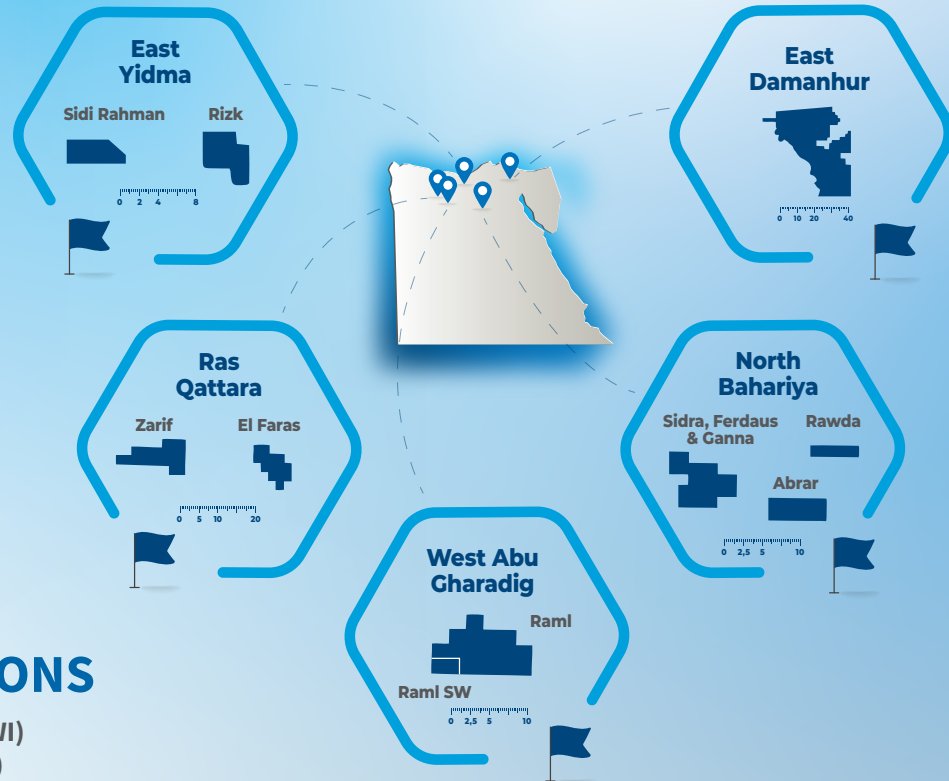
## OVERVIEW

- Present in Egypt since 1989
- Cairo Branch Office founded in 1997
- 1 operated and 4 non-operated concessions in partnership with renowned companies
- Monitoring and implementation of activities in accordance with the highest HSE standards

## RECENT HIGHLIGHTS

- 2020 oil production increased by 3% from 2019 and 23% from 2018
- The 5,613 meters (18,416 feet) deep exploration well Rizk-2D discovered oil and was put into production in 2019





## ACTIVE CONCESSIONS

### East Yidma (100% WI)

Operator: INA (100%)

### North Bahariya (20% WI)

Operator: Sahara North Bahariya (50%)

Partner: Greystone (30%)

### Ras Qattara (25% WI)

Operator: IEOC (75%)

### West Abu Gharadig (25% WI)

Operator: IEOC (45%)

Partner: Dana Petroleum (30%)

### East Damanhur (20% WI)

Operator: Wintershall DEA (40%)

Partner: Cheiron (40%)



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The logo for MOLGROUP, consisting of a white right-pointing triangle followed by the text 'MOLGROUP' in white, uppercase, sans-serif font, all contained within a red rectangular background.