

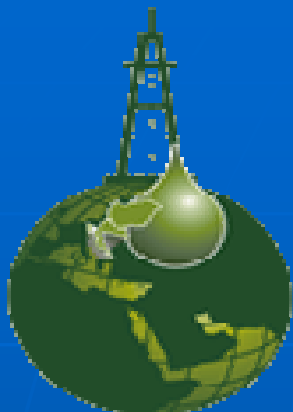


Applied Technology and Best Practices in CEE

Conference

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Society of Petroleum Engineers



**“APPLIED TECHNOLOGY AND
BEST PRACTICES IN CEE”**

17th of November 2011

Budapest, Hungary

**MODERN TECHNOLOGICAL APPROACH
TO DRILLING AND COMPLETION OF
PRODUCTION WELLS AT THE
CROATIAN NORTH ADRIATIC OFF-
SHORE GAS FIELDS**

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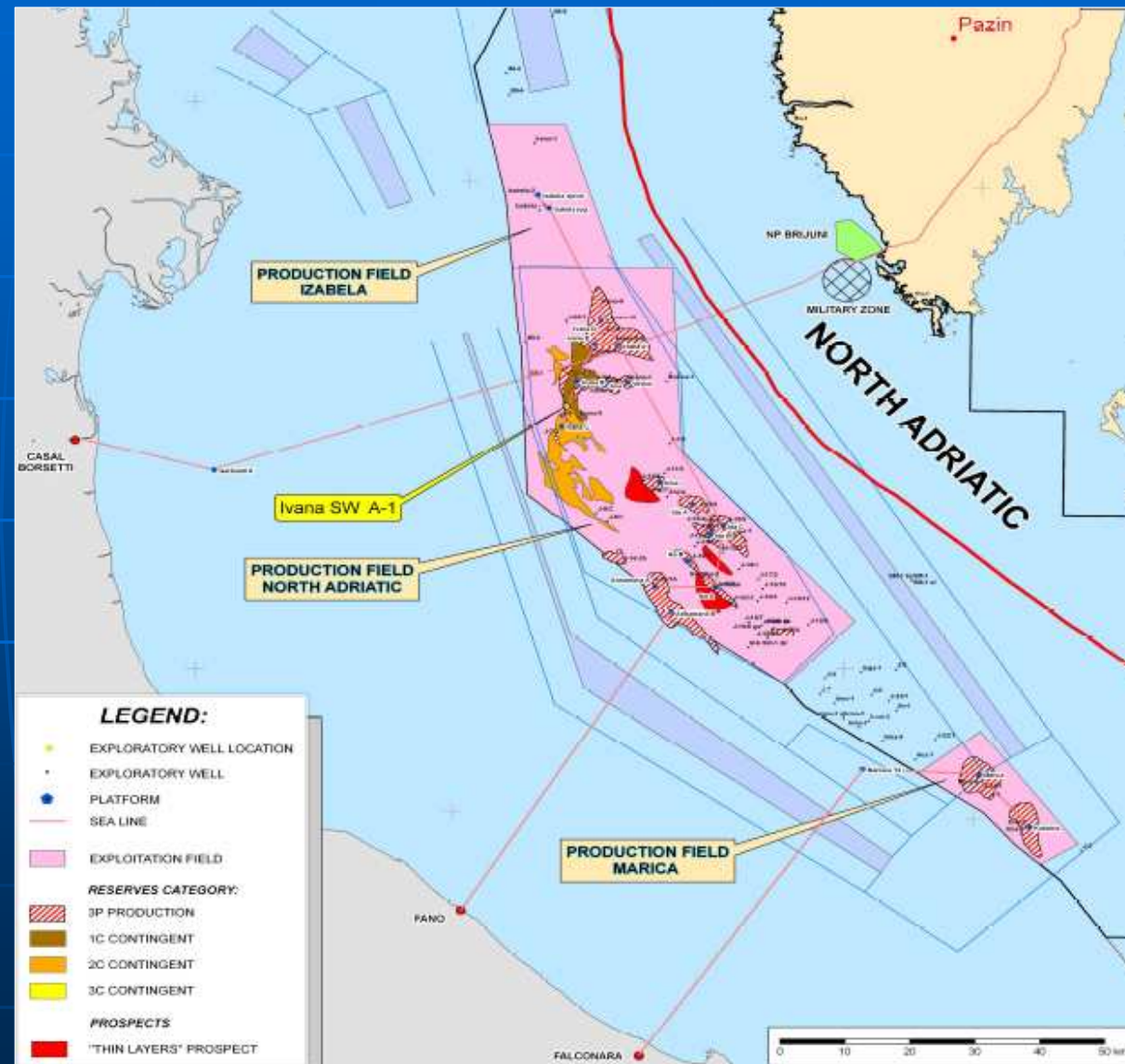
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CONTENT

- **Introduction**
- **Well Construction**
- **Well Completion**
- **Croatian Offshore Safety Regulations**
- **Conclusion**

NORTHERN ADRIATIC FIELDS SITUATION MAP

- INA's joint ventures
 - Inagip
 - Edina
- Start of development in 1999.
- Sea depth from 37 to 75 m
- 18 production platforms
- 46 production wells (40 slanted, 6 horizontal)
- 73 production strings
- Current production 5 M m³/day of gas
- 12 exploration wells (9 vertical, 3 slanted)



DEVELOPMENT PHASE JACK UP RIGS FLEET

- J/U Rig Labin - Croscos
 - Levingstone 111-C
 - Drawworks National 2000 HP
 - Year of built 1985
 - In operations up to 2003.
-
- J/U Rig Carl Norberg - Noble
 - Marathon LeTourneau 82-C
 - Drawworks National 2000 HP
 - Year of built 1976
 - In operations 2005 - 2007.
-
- J/U Rig Ocean King - Diamond
 - Marathon LeTourneau Class 116-C
 - Drawworks National 3000 HP
 - Year of built 1973
 - In operations 2008 - 2010.



WELL CONSTRUCTION TECHNOLOGY APPROACH

CONDUCTOR PIPE 26"/ 20"

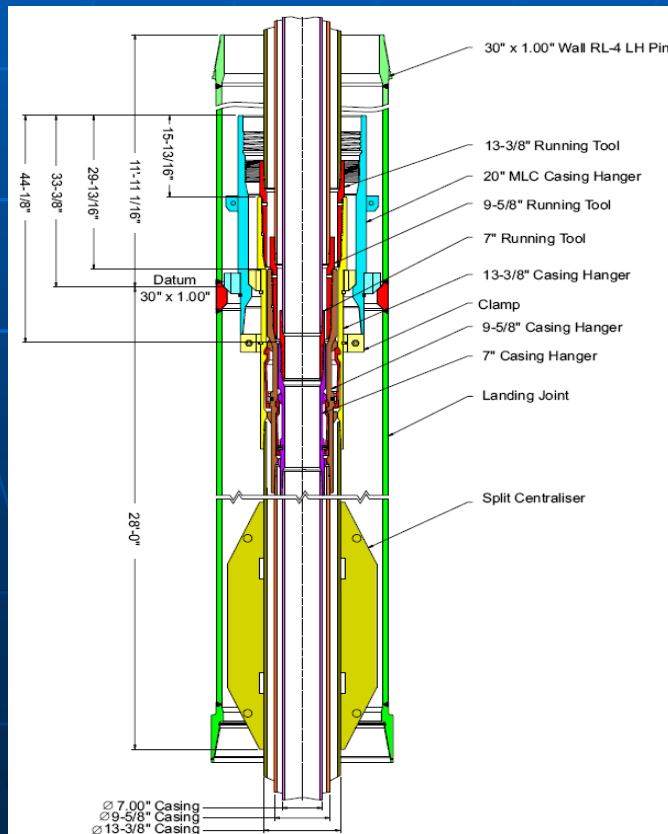
- Driven before rig arrival after jacket installation
- Penetration in sea bottom 50 m
- Washed by JU rig with 22"/16" bit



WELL CONSTRUCTION TECHNOLOGY APPROACH

MUDLINE SUSPENSION

- System for temporary abandonment of explorative well (2-3 m above mud line)
- Tie-back and completion ones when production platform is installed



BATCH MODE DRILLING

- Phase by phase drilling operations
- Time saving due to operations repetition
- Longitudinal and/or transversal skid of cantilever

a) WASHING PHASE CONDUCTOR PIPE 26"



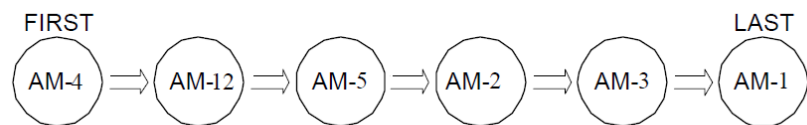
b) DRILLING PHASE 16"



c) DRILLING PHASE 12 1/4"



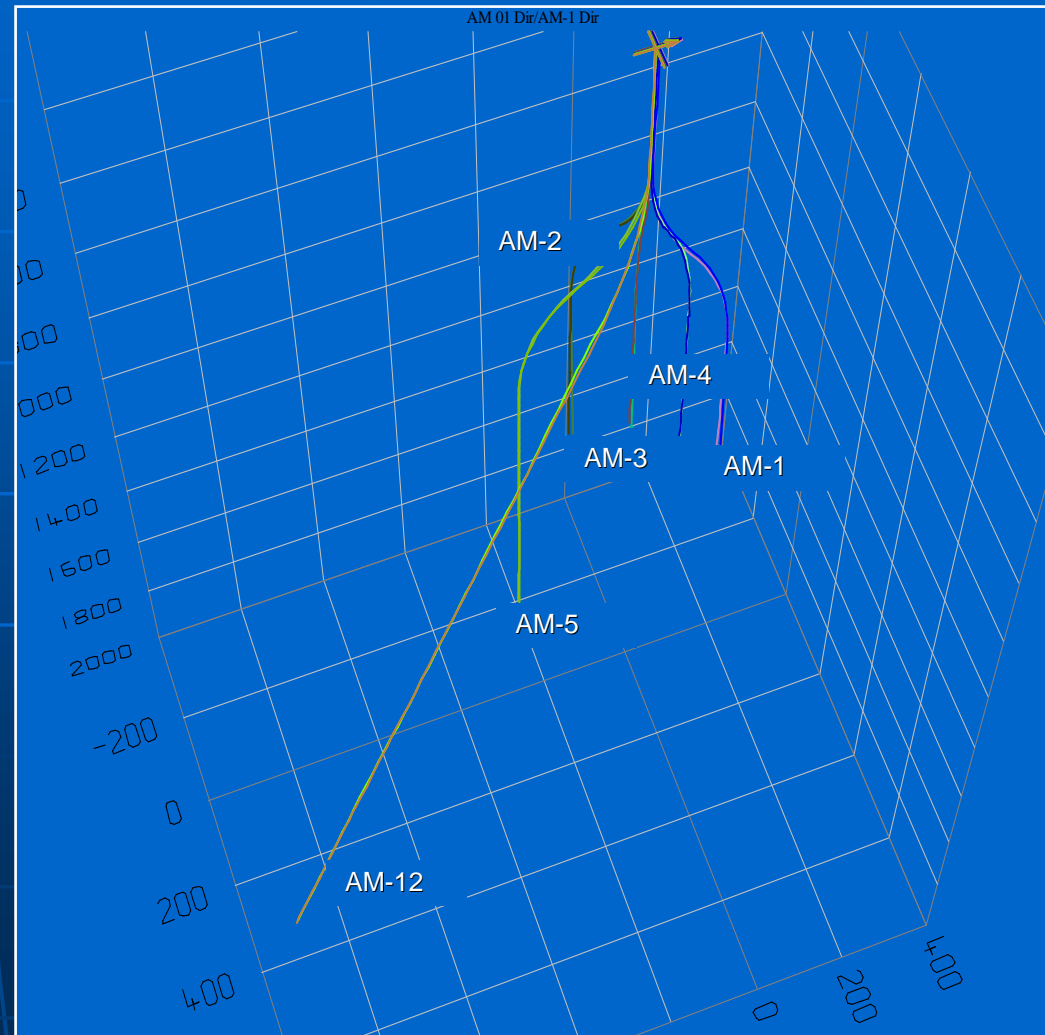
d) DRILLING PHASE 8 1/2"



WELL CONSTRUCTION TECHNOLOGY APPROACH

WELL PLANNING

- Developing thick/thin sand layers and carbonates
- One to six wells per jacket
- Targeting up to 31 layers from the one jacket (Annamaria)
- Wells shape "S" or "J"
- KOP below 13 3/8" or 9 5/8" casing shoe
- Build up by PDM
- Hold/drop in 8 1/2" section by steerable motor (PD)
- WL logging and/or LWD
- Water Base mud
- Inner string (surface csg) and Perkins method cementing



WELL CONSTRUCTION TECHNOLOGY APPROACH

SURFACE CASING PHASE

- Isolating the unconsolidated shallow formations, potential gas lenses and water layers
- Lithology: sand, shale, lignite
- Preparing kill mud MW=1,4 kg/l
- Drilling 16" phase with tricone bit
- Running FW-GE simple, easy to run mud MW=1,1 kg/l
- Setting 13 3/8" casing shoe at approx. 300 m
- Cementing by DP 5" inner string method stinged into casing shoe or collar (cem. slurry =1,98 kg/l)
- TOC at cellar deck (remedial cement job)
- M/U Wellhead and test at 40 bar

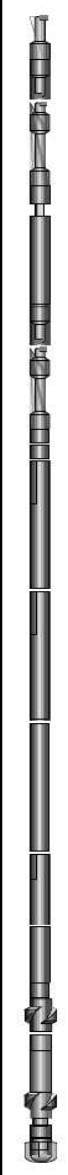
	Cum. Len. (m)
5" 19.50 DPG, 10% Wear	
15 x 5" HWDP (15 joints)	222.99
Crossover	82.98
1 x 8" DC	81.95
Hydraulics Jar	72.97
2 x 8" DC (2 joints)	63.12
8 1/32" NMDC	44.29
UBHO Sub	35.26
8" NMDC	34.23
PowerPulse	25.23
8-1/16" NM Pony DC	16.65
8-1/16" NM Pony DC	13.59
NM Float Sub	10.53
A962M5640XP (1.8 deg)	9.72
16" Bit	0.46

WELL CONSTRUCTION TECHNOLOGY

APPROACH

INTERMEDIATE CASING PHASE

- Setting above well targets and below build-up section
- Lithology mostly shale with thin sand layers
- Drilling 12 1/4" phase with tricone or PDC bit
- Running FW-LS low lime content, environmental friendly mud MW=1,15 kg/l
- Build up upto 6 deg./100 m using PDM
- Setting 9 5/8" casing shoe at 600 - 900 m TVD
- Cementing by Perkins method with non rotating drillable plugs using two cem. slurries (1,5 kg/l and 1,8 kg/l)
- TOC at 100 – 150 m above 13 3/8" shoe
- M/U Casing spool and test at 100-120 bar

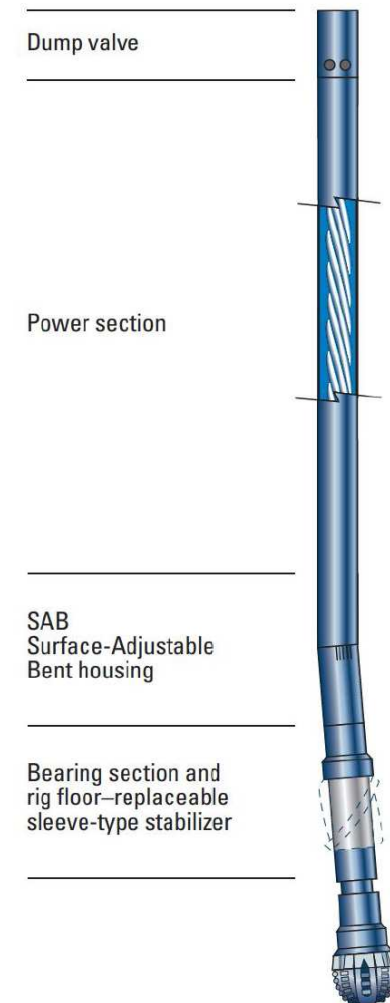


	Cum. Len. (m)
5" 19.50 DPG, 10% Wear	
12 x 5" HWDP (11 joints)	215.32
Hydraulic Jar	103.50
5 x 5" HWDP (5 joints)	93.88
Crossover	47.07
Circ. Sub	46.04
8 1/32" NMDC	45.12
8" NMDC	36.09
PowerPulse	27.09
8-1/16" NM Pony DC	18.51
8-1/16" NM Pony DC	15.45
NM Float Sub	12.39
11 3/4 NM Stabilizer	11.58
A800M4553XP (1.5 deg)	9.17
12 1/4 " Bit	0.25

WELL CONSTRUCTION TECHNOLOGY APPROACH

POWER PAK MOTOR

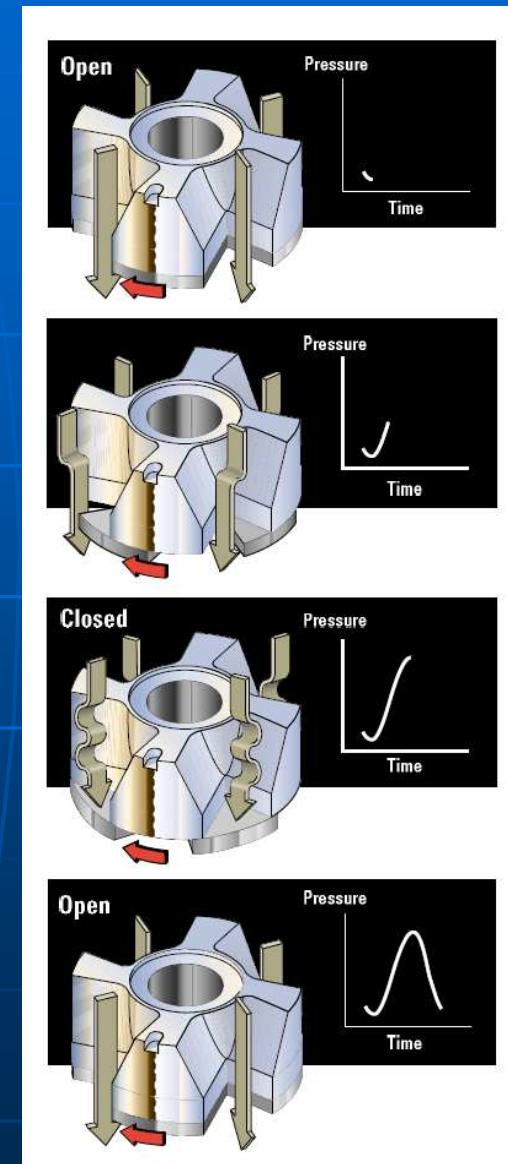
- Mud-lubricated bearings (M series)
- Variety of rotor/stator configurations (power, torque, speed, flow)
- Minimum interference with MWD
- Increasing ROP
- Reduce casing and bit wear



WELL CONSTRUCTION TECHNOLOGY APPROACH

MWD POWER PULSE


- Mud pulse telemetry tool that establishes the benchmark for reliability and data transmission rates
- Robust and reliable transmission in all mud types
- Continuous D&I measurements save rig time and minimize doglegs
- Data transmission rates of up to 16 bps provide high resolution, real-time logs
- Optional gamma ray sensor



WELL CONSTRUCTION TECHNOLOGY APPROACH

PRODUCTION CASING PHASE

- Covering all predicted production intervals
- Lithology alternation of shale and sand layers
- Drilling 8 1/2" phase with PDC bit
- Running FW-PO-LU environmental friendly mud MW=1,25 kg/l
- Hold an angle (45-60 deg. "J" shape) or drop to vertical ("S" shape wells) using steerable motor
- Setting 7" casing shoe at TD 1400 – 2400 m MD
- Cementing by Perkins method with non rotating drillable plugs using one or two cem. slurries (1,5 kg/l and 1,7 kg/l)
- TOC at 200 m above 9 5/8" shoe
- M/U Tubing spool and test at 140-160 bar

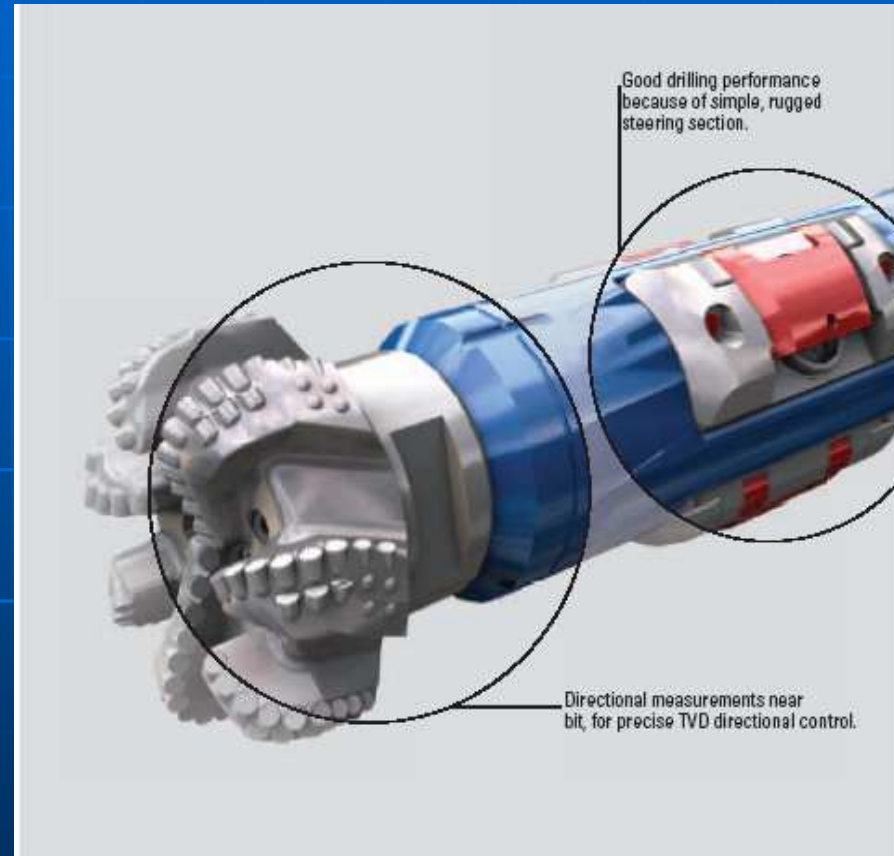


	Cum. Len. (m)
5" 19.50 DPS	218.49
5" HWDP (9 joints)	208.49
Hydraulic Jar	124.56
5" HWDP (9 joints)	115.28
Circulating sub	31.35
6 3/4" NMDC	30.43
TeleScope	21.06
GVR	12.58
PD NM Flex Collar	9.04
PD SRX	6.16
PD 675 X5	4.41

WELL CONSTRUCTION TECHNOLOGY APPROACH

POWER DRIVE

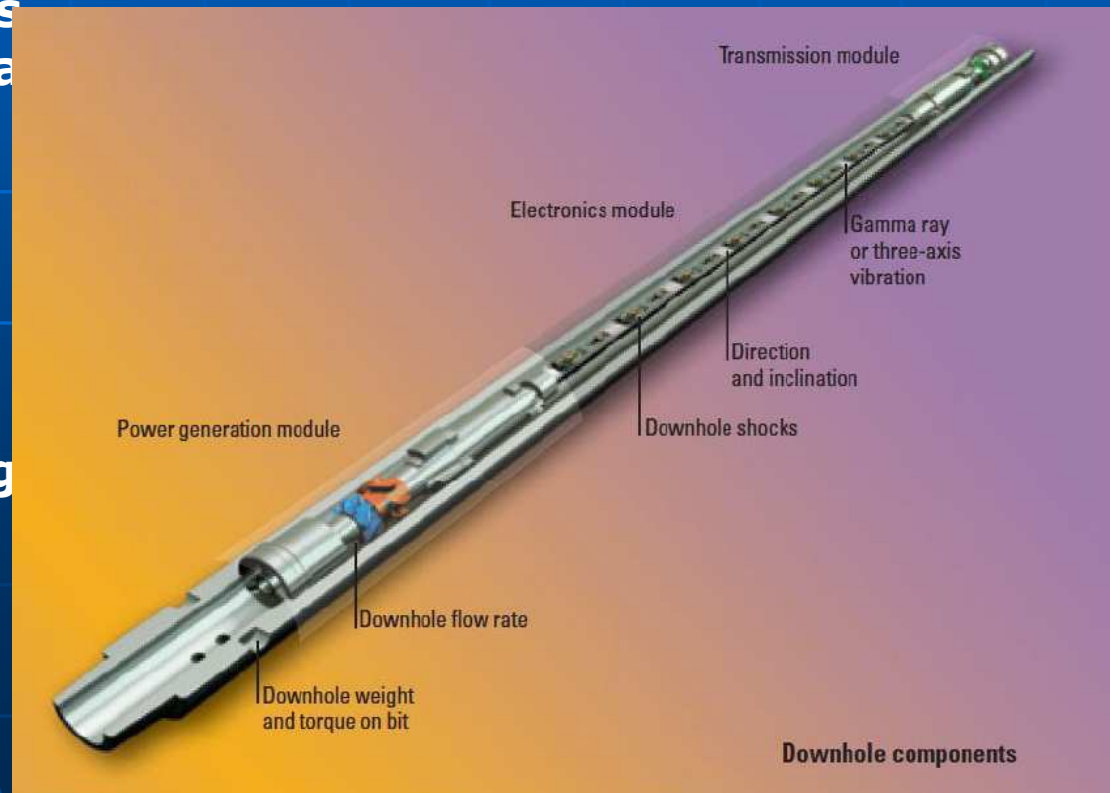
- **Push-the-bit system designed for full directional control while rotating the drillstring**
- **Accurate drilling and wellbore placement**
- **Near-bit measurements in real time**
- **Efficient downlink systems and automatic inclination hold**
- **Optional azimuthal gamma ray sensor**



WELL CONSTRUCTION TECHNOLOGY APPROACH

MWD TELESCOPE

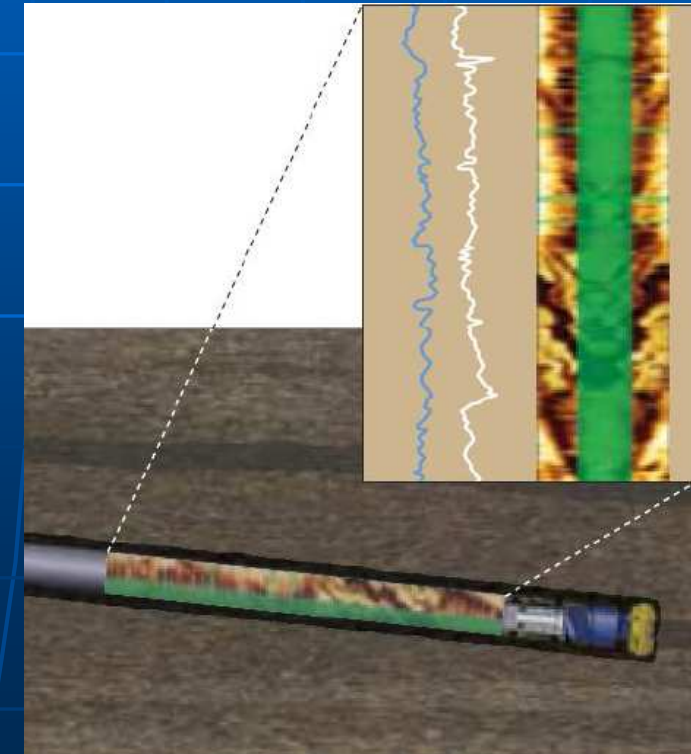
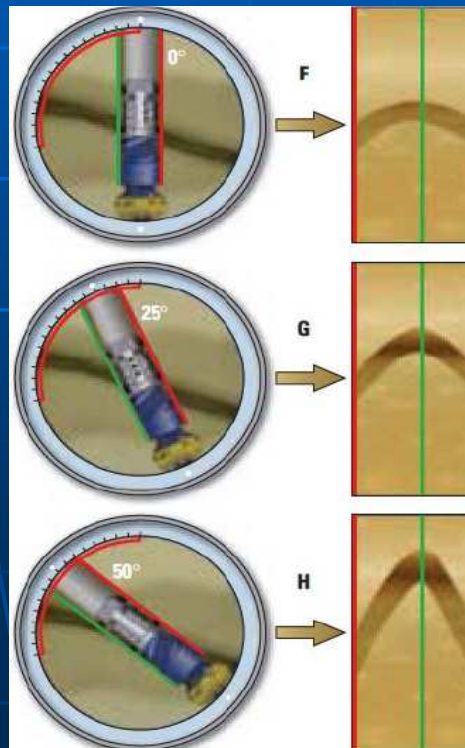
- Hi-speed telemetry while drilling system
- Ability to power and transmit data from multiple downhole tools
- Accurate continuous and static directional and inclination measurements
- Real time updates on shock, flow and vibrations
- Date memory enables post drilling analysis



WELL CONSTRUCTION TECHNOLOGY APPROACH

LWD GVR

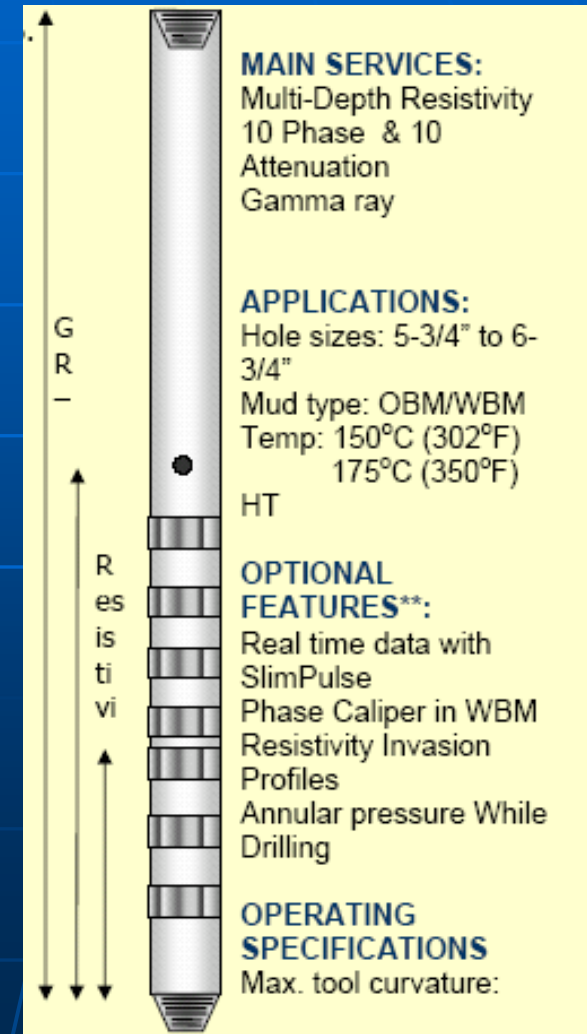
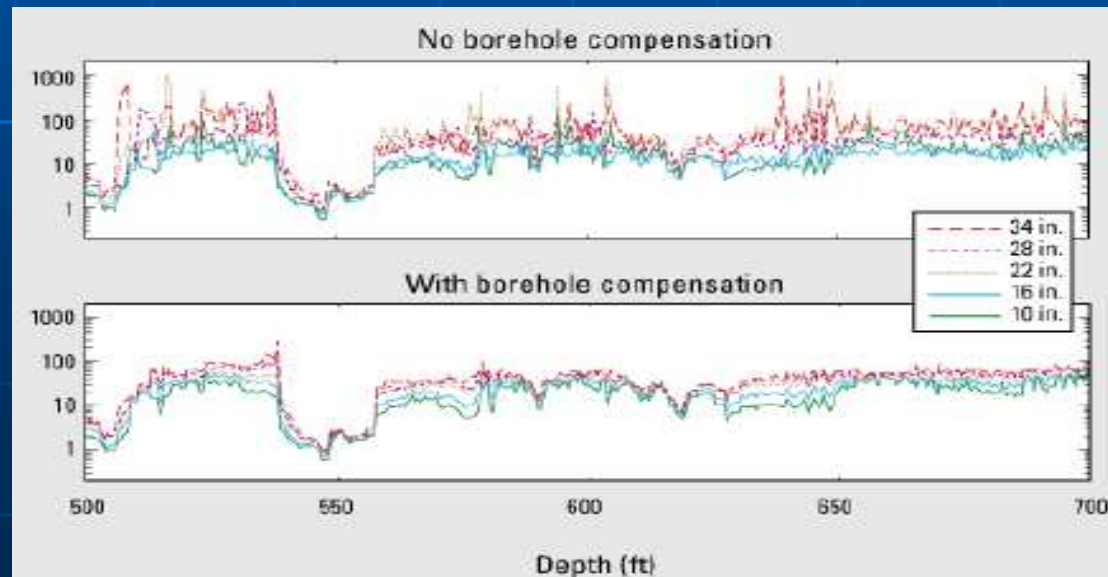
- GeoVision Resistivity tool
- While-drilling visualization and dip interpretation of real-time resistivity images
- Interactive 3D visualization of borehole images along the well trajectory
- Possibility for resistivity at the bit monitoring in case of running w/o motor



WELL CONSTRUCTION TECHNOLOGY APPROACH

LWD ARC VISION

- Array resistivity compensated tool
- Resistivity, gamma ray, inclination and annular pressure data
- Can withstand a high sand content and high mud flow rates which ensure maximum power transfer

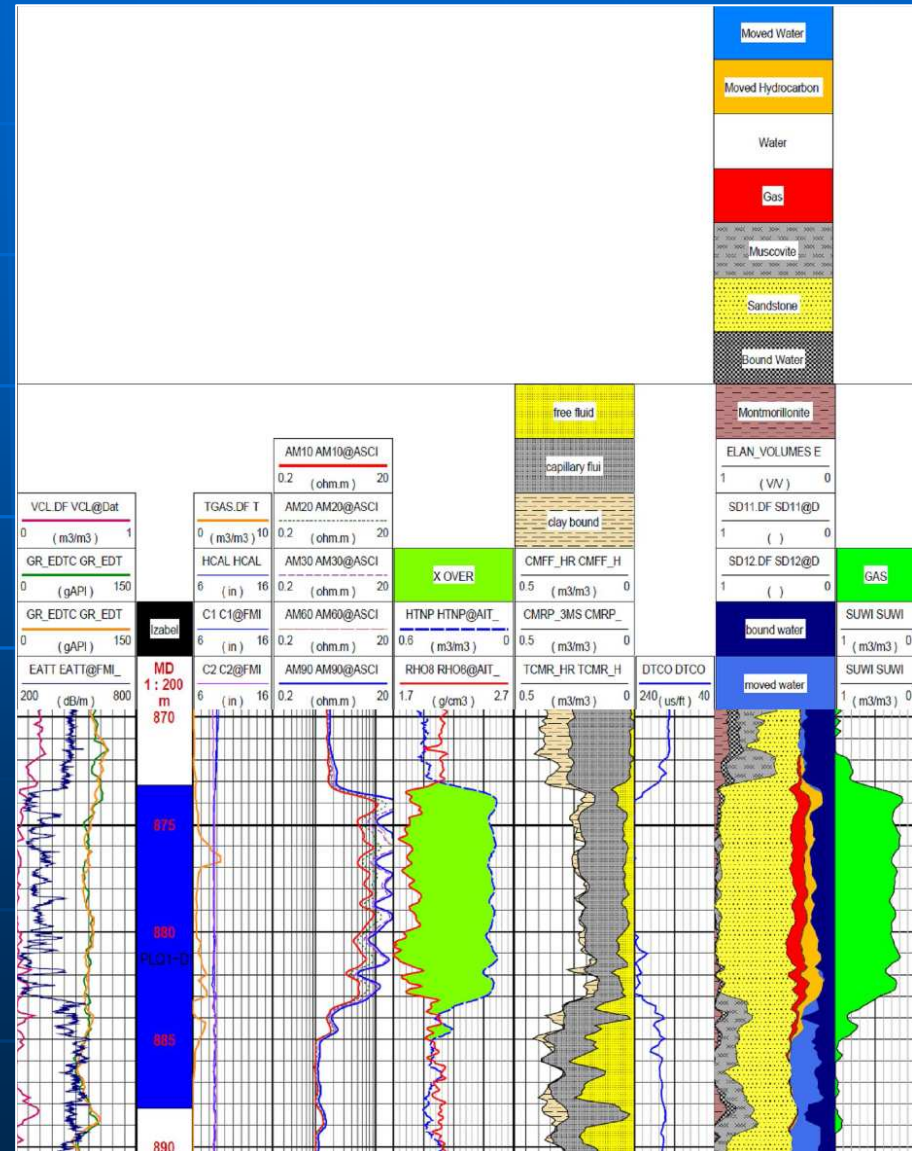


WELL CONSTRUCTION TECHNOLOGY APPROACH

WL LOGGING

Quick look combined log

- Caliper
- Gamma ray – nature radioactivity
- Resistivity
- MDT – modular dynamic tester
- Neutron – neutron porosity
- Density
- CMR – combined magnetic resonance



WELL COMPLETION - GENERAL

- Dual & single completion – 2 3/8"; 4,7#; L-80, P-110; ADMS, VamTOP (Izabela); IKA A-1 DIR – 2 7/8"; 6,7#; L-80; ADMS
- Material used:
 - P-110 & L-80 (Ika & Izabela) for tubulars;
 - L-80, AISI 41XX, AISI 316, 9CR-1MO for DHE;
 - Nitrile, Viton & Teflon for sealing items
- Wellhead & X-mass – API material class D.D.
- Completion fluid – brine CaCl_2 ; SG= 1,20

WELLS COMPLETION – PHASES GENERAL

- Open hole completion & isolation
- Well preparation for completion
- Sand layers overbalanced perforating (phase 2)
- Perforations back surging
or
- TCP & back surging (phase 3)
- Frack & pack or high rate water pack gravel packing
- Well completion
- Well cleaning & testing

OPEN HOLE COMPLETION & ISOLATION – IKA CARBONATES

- GP packer, MOE, SSD (close up), “X” LN, shear out ball seat sub, perforated tubing, mule shoe guide
- Spotted 0,5 m Baracarb
- Shifting tool closes SSD when pooh setting tool
- Outside liner 5” cca 20 m in IKA A-2,3 HOR wells
- Inside casing 7” 0,5 m in IKA B-1 DIR well

	Perf	Dev °	TOP	BOTTOM	NET	
Sand Size:		Fluid:				
Item	Description					
	Setting Tool + X-Over+Pup joint					
14	G.P. Packer size 70B4-40 mod SC1R					
13	Millout Extension 5 1/2" LTC Pin x Pin					
12	X-Over 5 1/2" LTC Box x 2 3/8" 4.7 #/ft ADMS Box					
11	SSD 'CMD' 1.875" - 2 3/8" 4.7 #/ft ADMS					
10	Tubing 2 3/8" 4.7 #/ft ADMS					
9	Landing Nipple 'X' 1.875" - 2 3/8" 4.7#/ft ADMS					
8	Tubing 2 3/8" 4.7 #/ft ADMS					
7	X-Over 2 3/8" 4.7 #/ft : ADMS Box x PJD Pin					
6	X-Over 2 3/8" 4.7 #/ft PJD Box x 2 7/8" 6.5 #/ft NU Pin					
5	Shear Out Ball Seat 2 7/8" NU Box x 3 1/2" EU Pin					
4	X-Over 3 1/2" EU Box x 3 1/2" 9.2 #/ft PJD Pin					
3	Tubing 3 1/2" 9.2 #/ft PJD					
2	Perforated Tubing 3 1/2" 9.2 #/ft PJD					
1	Pup Joint 3 1/2" PJD Box x 1/2 M.S.					
BHA Length 499.70 m						

WELL PREPARATION

- Clean fluid (20 NTU minimal) and working environment are mandatory for GP installation
- Typical well cleaning programme:
 - RIH taper mill & scraper
 - Mud conditioning and circulating
 - Push pill → caustic pill → acid pill → neutralization pill → sea water
 - Sea water displacement w/ 1,20 kg/l filtered CaCl_2 brine
- Cartridge & de filtering units used

PERFORATING

- Wire line conveyed casing gun in case of Frac & Pack
- 4 1/2"; 12 spf; 135/45° DX; big hole charges
- Under overbalanced conditions of 1,20 kg/l filtered CaCl_2 brine
- Usually not noticed significant brine losses after perforating

PERFORATING & BACK SURGING

- TCP-DST in case of HRWP
- 4 1/2"; 12 SPF; 135/45°; RDX; Big Hole charges
- “Clean perforations” mandatory for effective HRWP gravel packing
- Cca 300 – 500 psi underbalance applied
- Pressure recorded downhole used for pressure build up analysis
- If some sand were recorded on the surface downhole valve were closed ASAP
- LCM pill spotted

GRAVEL PACKING

- **Technique applied:**
 - Alpha / Beta for horizontal open hole
 - Frack & Pack
 - High rate water pack
- **Cased hole GP technique selection criteria:**
 - Frack & Pack were preferred technique due to near wellbore skin bypass, vertical sublayers connectivity and turbulence effect reduction
 - Limitation factors were vicinity of free water and no existence of good barriers above and below the layer
 - For all other situations HRWP in combination w/ back surging were preferred technique

GRAVEL PACKING - FRAC & PACK

- “Econoprop” man made 30-50 US mesh propanant used
- Non damaging 2,2 - 2,5% VES (Visco Elastic Surfactant) in sea water w/3% KCl as a carrier fluid
- “Slim pack” prepacked screens 4” gauge 8

GRAVEL PACKING - HRWP

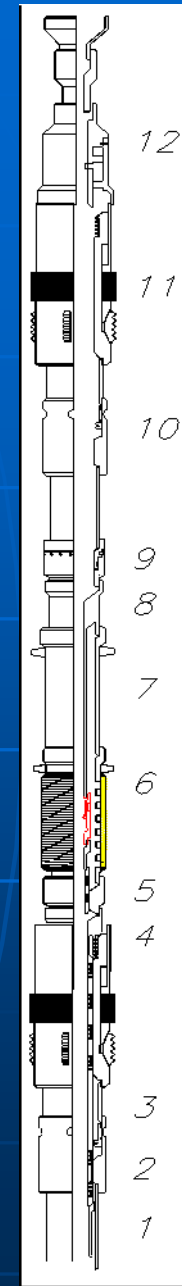
- Standard sand 40-60 US mesh used
- CaCl_2 1,20 kg/l brine as a carrier fluid
- “Slim pack” prepacked screens 4” gauge 8
- Acid job w/ HCOOH 10% performed in case of LCM pill spotted after “back surging”

GRAVEL PACKING – HORIZONTAL OPEN HOLE

- Standard sand 20-40, premium screen fine mesh
- CaCl_2 1,30 kg/l brine as a carrier fluid

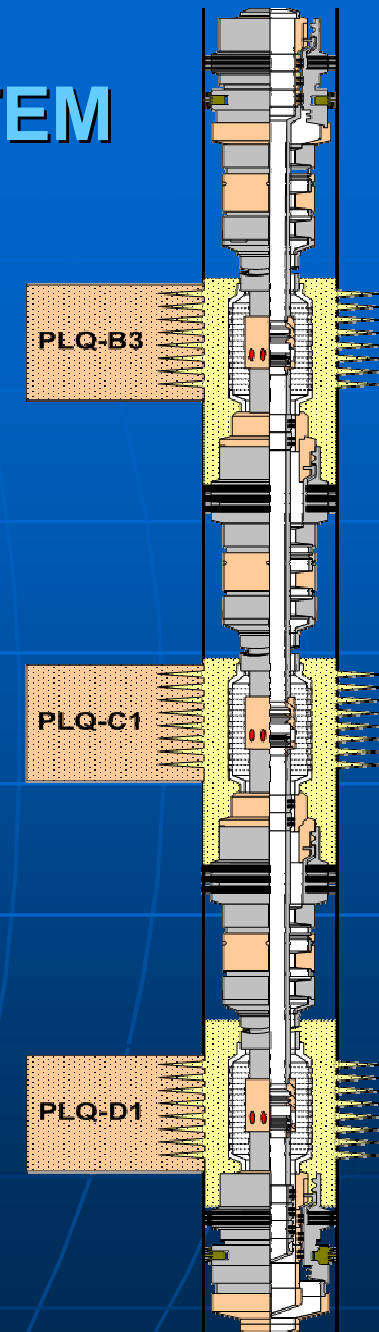
DOUBLE PIN SUB

- Mechanical system for fluid loss control after gravel packing
- Using double pin sub inner string w/SSD (close up) is deployed w/GP assembly together
- Circulation during GP job is allowed through opened SSD
- Layer-SSD is closed w/ shifting tool when the crossover tool is pulled after the job
- Can be used for layer by layer application



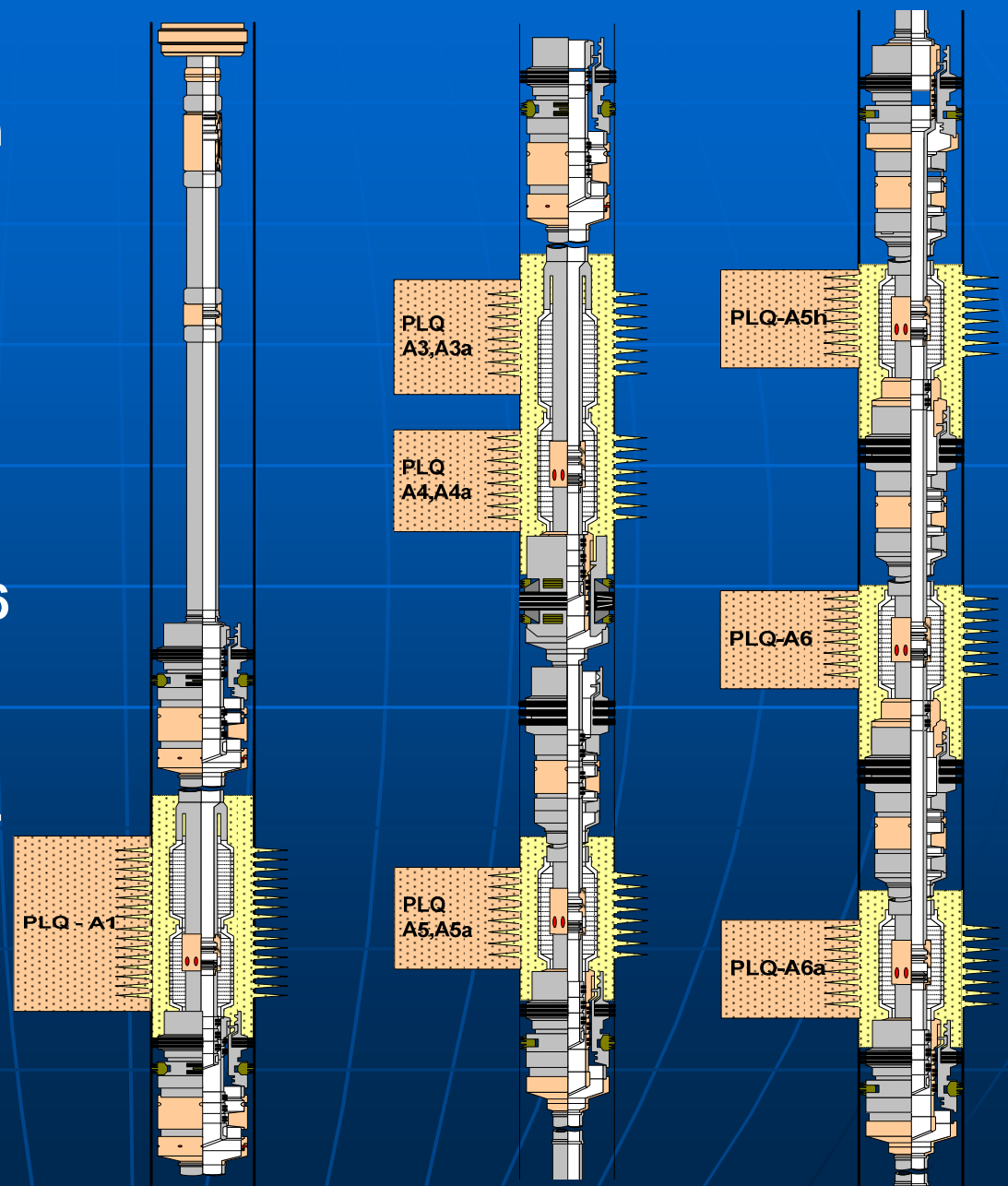
SINGLE TRIP MULTI ZONAL SYSTEM

- Allows multiple zone to be gravel packed in the single trip
- Consisting of multiple sets of screens and packer assemblies which are runs in to the well in one trip
- During gravel packing each zone is completely isolated from other
- Operates using the same positions incorporated in standard GP assembly; squeeze, circulating and reverse
- Substantially reduces rig time and costs associated w/ standard multiple zone system

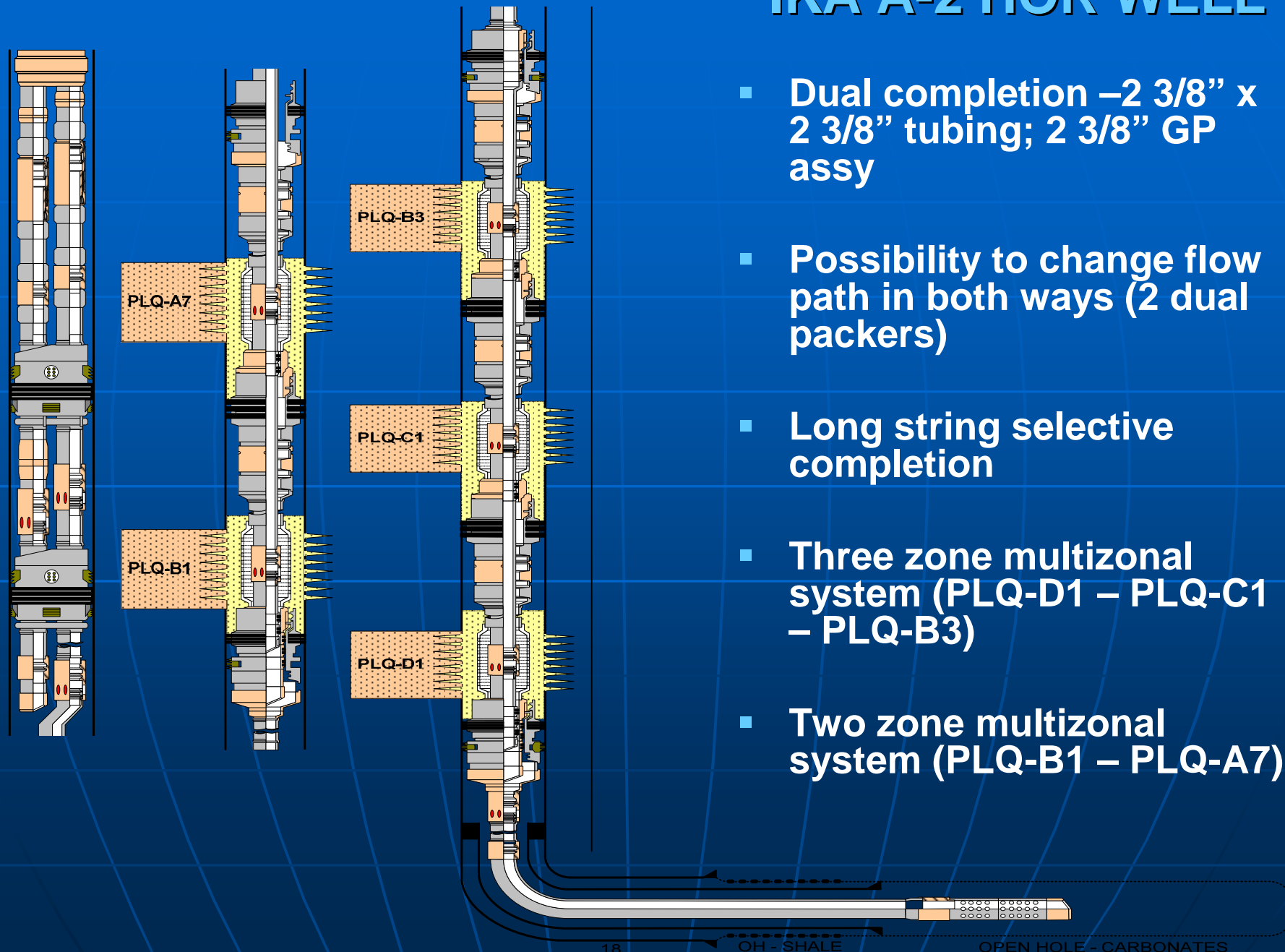


IKA A-1 DIR WELL

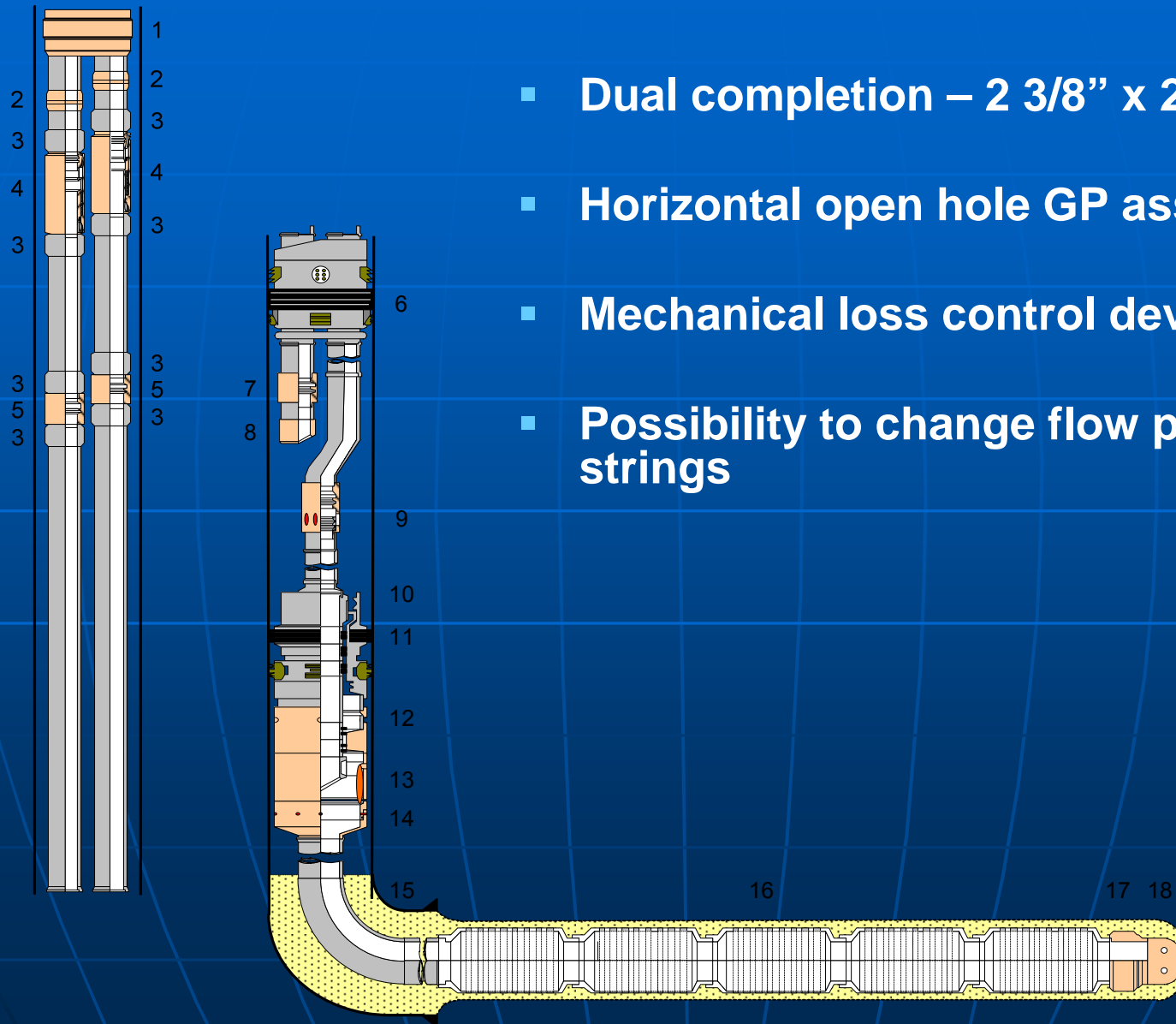
- Single selective completion – 2 7/8" tubing; 2 3/8" GP assy
- Two zone multizonal system (PLQ-A8 – PLQ-A12)
- Three zone multizonal system (PLQ-A6A – PLQ-A6 – PLQ-A5H)
- Double pin sub used on layers PLQ-A4, A4A & PLQ-A3, A3A and layer PLQ-A1 completion



IKA A-2 HOR WELL

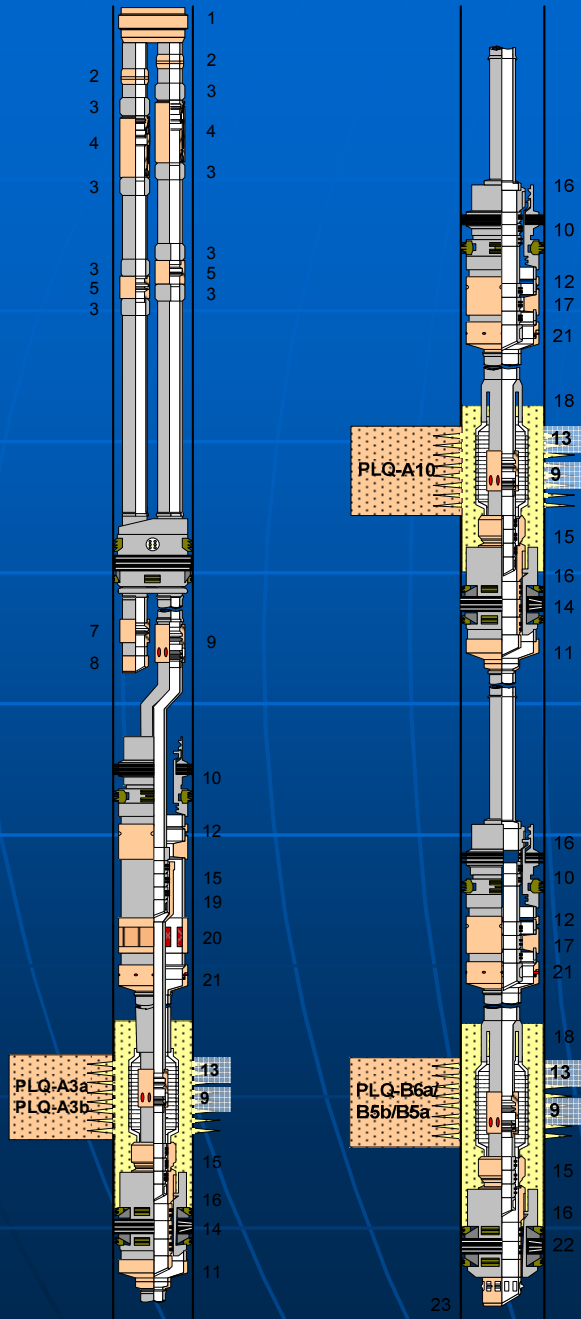


KATARINA - 1 HOR WELL



- Dual completion – 2 3/8" x 2 3/8" tubing;
- Horizontal open hole GP assy.
- Mechanical loss control device
- Possibility to change flow path in both strings

ANNAMARIA - 3 DIR WELL



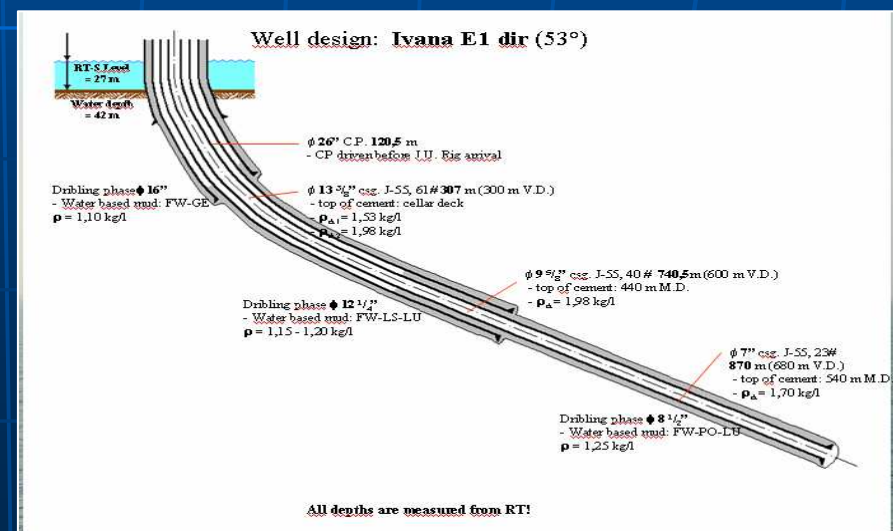
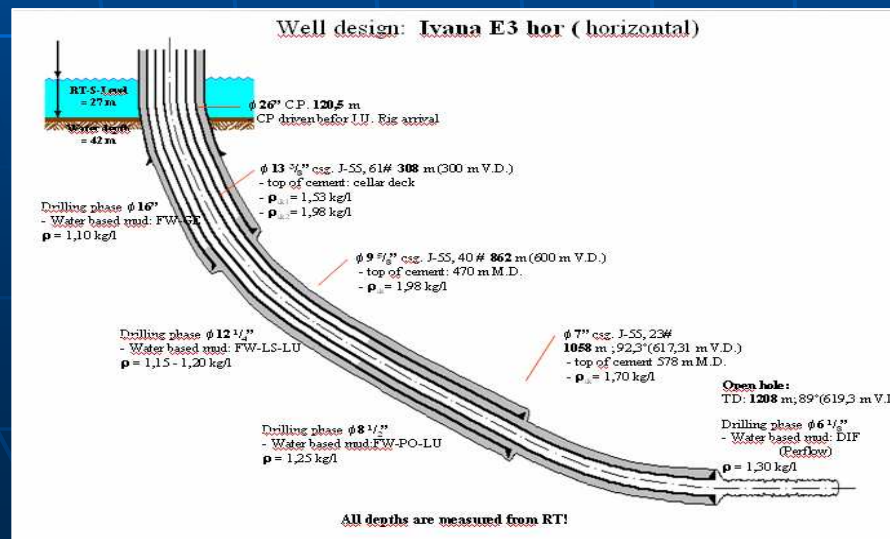
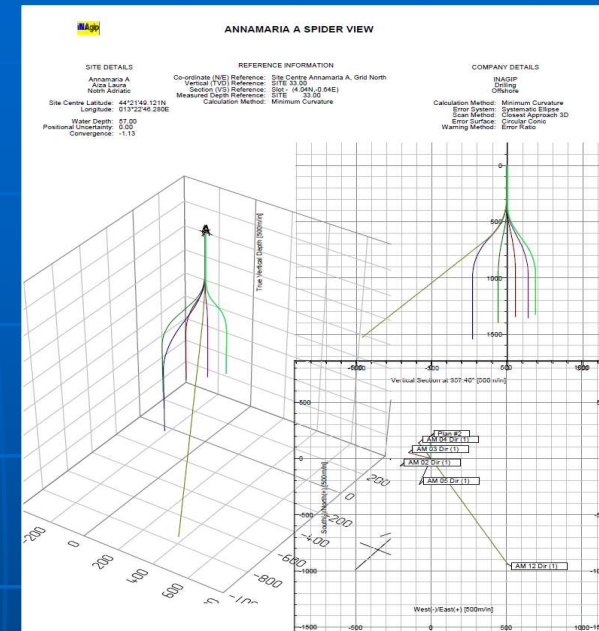
- Dual completion –2 3/8” x 2 3/8” tubing
- 2 double pin sub GP assy.
- 2 spacers
- Long string selective completion
- F&P + 2 HRWP
- Mechanical annular loss control valve (SAF)

WELL CLEANING & TESTING

- After well completion tubing string had been pickled from the rust or grease using CT
- Layers were tested selectively manipulating w/ ssd, recording pressure and temperature on the surface and downhole for the carbonate reservoir
- In cases where lcm pills were spotted in front of the screens because of the losses after gravel packing, acid job before testing was performed w/ 10% HCOOH
- Results obtained from back surging (before sand control) represents real reservoir characteristic
- Results obtained from clean-up (after sand control) is characterized by lower productivity due to enormous loss of completion fluid, but with its fast recovery

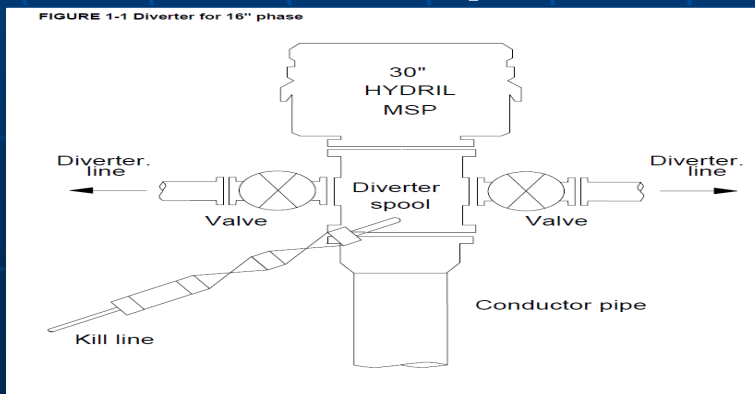
INA OFFSHORE WELL CONTROL ISSUES

- Shallow gas policy
- Diverter configuration
- Kick tolerance, Choke margin
- Mud design, Cement slurry design
- BOP configurations for drilling & completion
- Well head – compact / X- mass tree (dual string)
- Well control procedure
- P&A of exploration wells



SHALLOW GAS POLICY / DIVERTER

- For unknown area, sample coring within site survey, in pre phase is required to verify geomechanical mud line properties (for aft. legs penetration requirements)
- Exploration well / production platform position to avoid shallow gas - high amplitude anomalies up to 300m TVD; shallow seismic is mandatory;
- Conductor pipes 30" (for expl. wells) & 26" / 22" for production wells are required to be driven up to 30 – 50 m in mud line;
- In case of medium ampl. anomalies, pilot drilling Ø 8 ½" (prior drilling first hole of 16")
- Drilling phase Ø 16" w/Diverter system WP 1000/500 psi / 12" two lines w/hydr./pneum. valves; kill mud 1,4 kg/l in stand by
- Mud losses usually occurred below CP shoe (cement plug jobs)



KICK TOLERANCE / CHOKE MARGIN / MUD WEIGHT

■ Kick tolerance- calculator: bar/10m

- Hole Ø 12 1/4" : max 11 m³
- Hole Ø 8 1/2" : max 13 m³
- Hole Ø 6" : max 16 m³

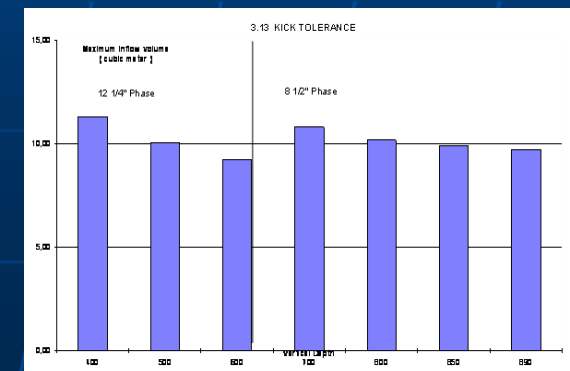
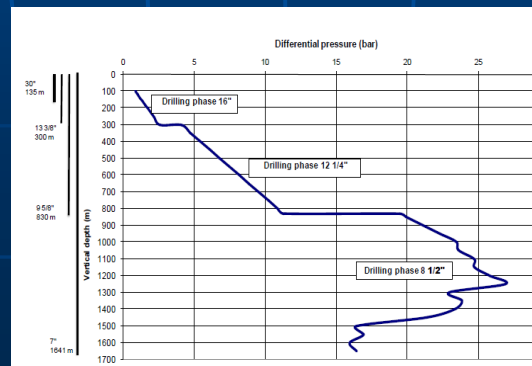
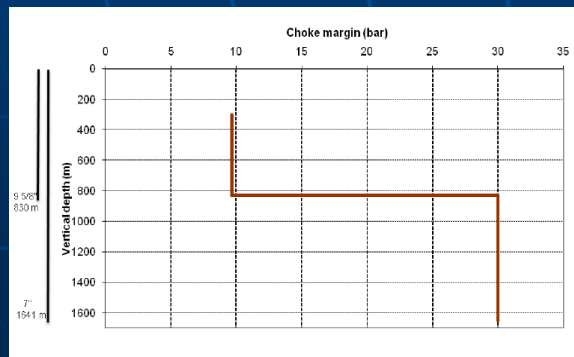
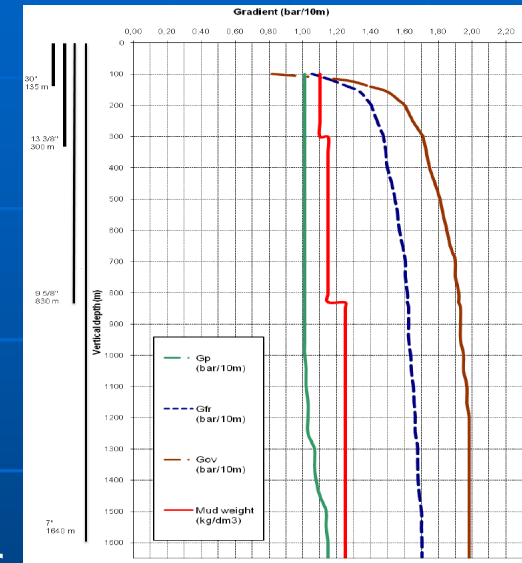
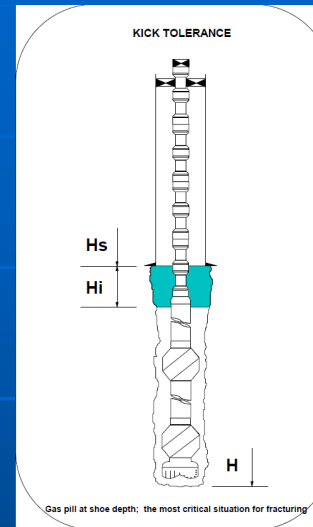
■ Choke margin:

- Hole Ø12 1/4" : min 10 bar
- Hole Ø 8 1/2" : min 30 bar
- Hole Ø 6" : min 60 bar

■ Mud design:

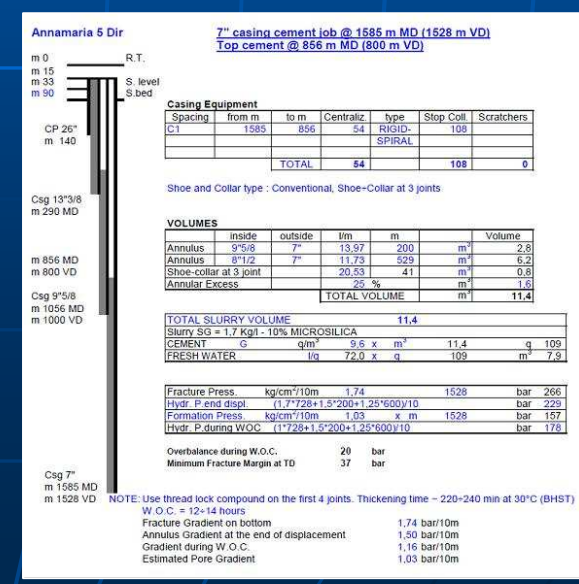
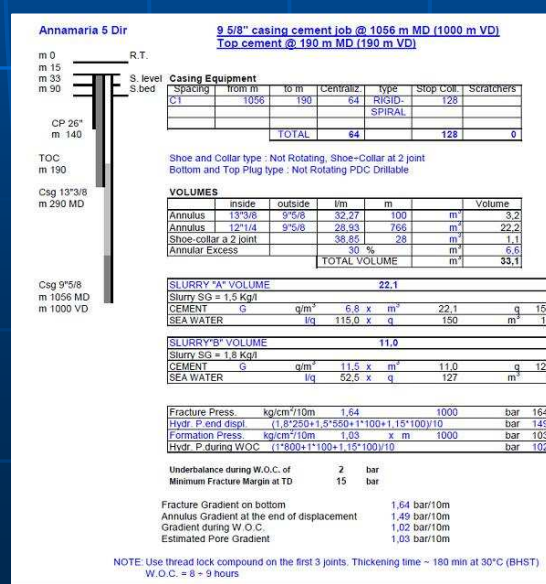
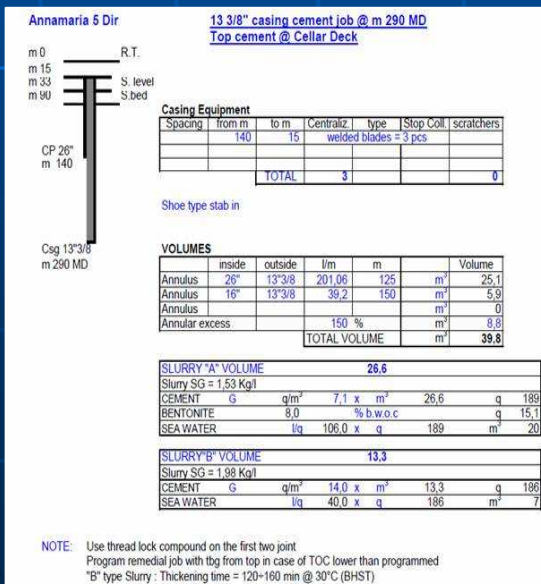
- Hole Ø16": FW-GE; 1,10 kg/l ; P dif cca 5 bar
- Hole Ø12 1/4": FW-LS-LU; 1,15 kg/l; Pdif cca 11 bar
- Hole Ø 8 1/2": FW-PO-LU; 1,25 kg/l / reservoir drilling; Pdif up to 25 bar
- Hole Ø 6": DIF; 1,25 kg/l / reservoir drilling / open hole-horiz.; Pdif up to 25 bar

General: PPG=1,03-1,16



CEMENT SLURRY DESIGN

- **Casing 13 3/8" up to 300m RT-VD:**
 - For exploration well: TOC to cca 5 m below mud line; Lead cs = 1,53 kg/l / Tail cs = 1,98 kg/l (sea water)
 - For production well: TOC to top of Cellar Deck ; same as a.m.
- **Casing 9 5/8" cca 600 – 800 m RT-VD:**
 - For exploration/production wells TOC up to 200m in previous csg;
 - Lead cs = 1,50 kg/l / Tail cs = 1,80 kg/l ; 3% Microsilica (sea water);
- **Casing 7" cca 700 – 1700 m RT- VD:**
 - For exploration/production wells TOC up to 200m in previous csg;
 - Lead cs = 1,70 kg/l ; 10% Microsilica (fresh water)



BOP CONFIGURATION

■ In Drilling mode:

- One Bag type preventer – 5M
- For Ram preventers (two double) – 10M
 - Upper Pipe Rams : Variable 4"– 7"
 - Blind/Shear Rams
 - Lower Pipe Rams (1) : 2 7/8" – 5"
 - Lower Pipe Rams (2) : 5"

■ In Completion mode:

- One Bag type preventer – 5M
- For Ram preventers (two double) – 10M
 - Upper Pipe Rams : Centralizing
 - Blind/Shear Rams
 - Lower Pipe Rams (1) : 2 3/8" – 3 1/2"
 - Lower Pipe Rams (2) : Dual 2 3/8"

■ BOP test :

- prior Drilling operations
- on WH installation
- every 14 days

■ Accumulator Unit WP 3000 PSI, to meet requirement a.m. BOP configuration; function test; 2 remote panels (rig floor & rig supt. office)

■ Casing test:

- Bump plug at the end of cementing job
- After WH installation w/BOP test

FIGURE 1-3 BOP Stack for 12 1/4" and 8 1/2" phase

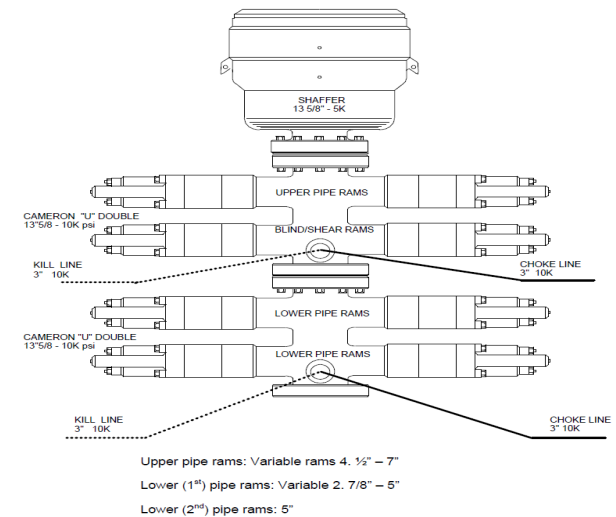
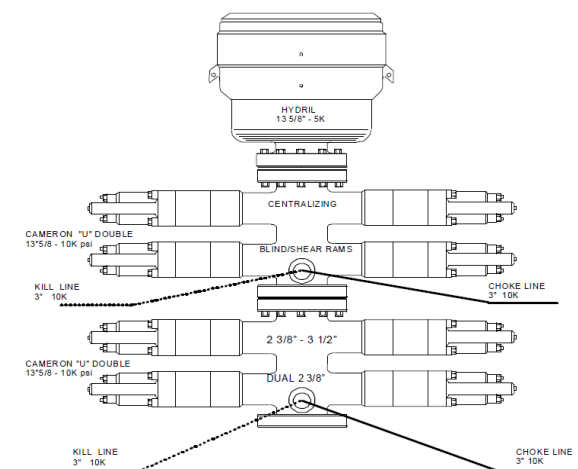
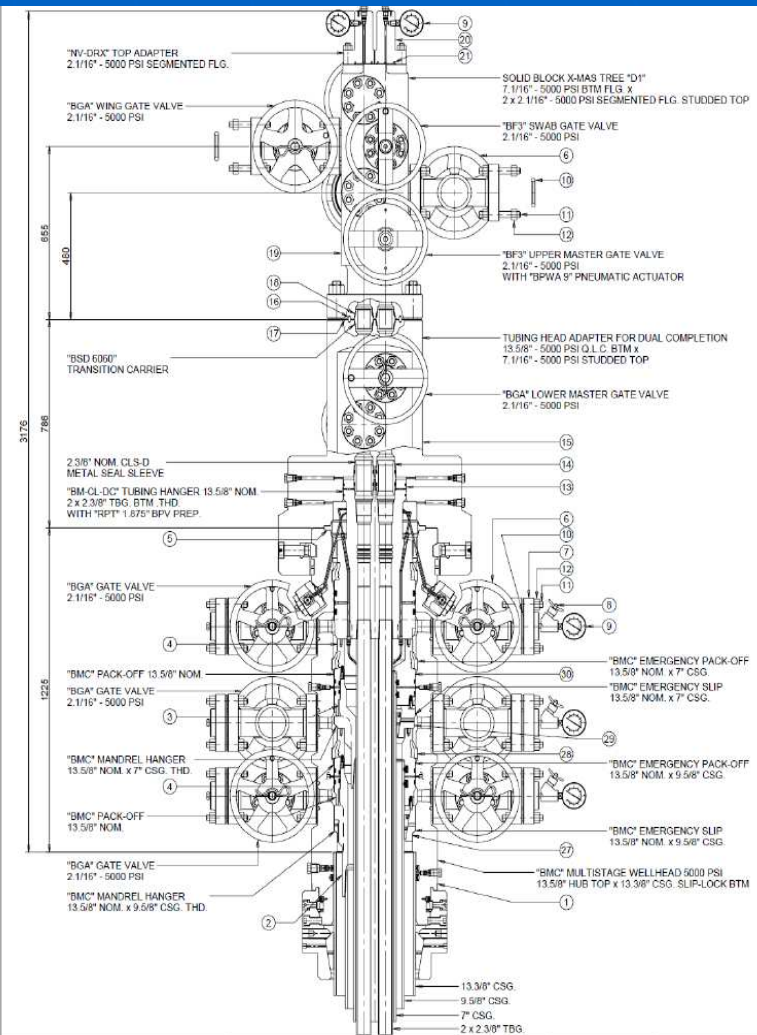
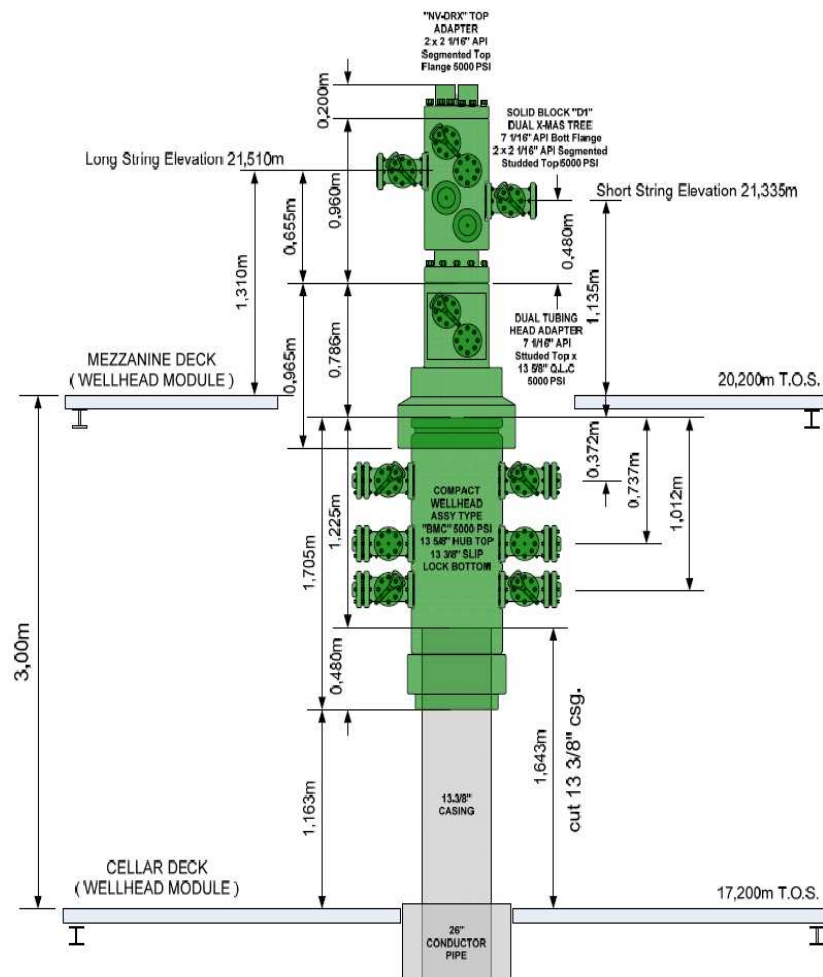


FIGURE 4-1 Bop arrangement during completion phase



WELL HEAD – COMPACT / X-MAS TREE (DUAL STRING)

FIGURE 3-28 Annamaria A platform wellhead and x-mas tree configuration



CLIENTE CUSTOMER	IMPIANTO PLANT	N° ORDINE ORDER N°	COMMESSA B. E. JOB	ANNO YEAR
INAGIP D.O.O.	ANNAMARIA 1,2,3,4,5,12	1535-01	612557	2008

WELL CONTROL PROCEDURE

HARD SHUT-IN PROCEDURES

WHILE DRILLING

PIT VOLUME INCREASE

DRILLING BREAK

- STOP DRILLING
- RAISE KELLY OR TOP DRIVE
- STOP PUMP
- CHECK FOR FLOW
- NOTIFY DRILLING CONTRACTOR AND COMPANY REPRESENTATIVES

THE WELL FLOWS

THE WELL DOESN'T FLOW

- CLOSE ANNULAR BOP
- CHECK CHOKE POSITION (CLOSED)
- IF NEEDED, CLOSE THE APPROPRIATE PIPE RAMS
- OPEN THE HYDRAULIC OPERATED VALVE (HCR) ON CHOKE LINE
- RECORD TIME, SIDPP AND SICP
- KICK VOLUME (PIT GAIN)
- PREPARE FOR KILLING OPERATIONS

- CIRCULATE BOTTOMS UP TO ANALYSE MUD PROPERTIES AND DRILLED CUTTINGS
- IF DRILLING IS RESUMED CHECK PIT LEVEL CAREFULLY

HARD SHUT-IN PROCEDURES

WHILE TRIPPING DP/DC OR A LINER LANDING STRING

THE MUD VOLUME IN TRIP TANK IS DIFFERENT FROM THE STEEL VOLUME OF PIPE PULLED OUT OF OR RUN IN HOLE

- STOP TRIPPING (BE SURE THAT NO TOOL JOINT IS OPPOSITE ANY OF THE RAMS IN THE BOP STACK)
- NOTIFY DRILLING CONTRACTOR AND COMPANY REPRESENTATIVES

THE WELL DOESN'T FLOW

- RUN PIPES BACK TO BOTTOM
- RECHECK FOR FLOW

THE WELL DOESN'T FLOW

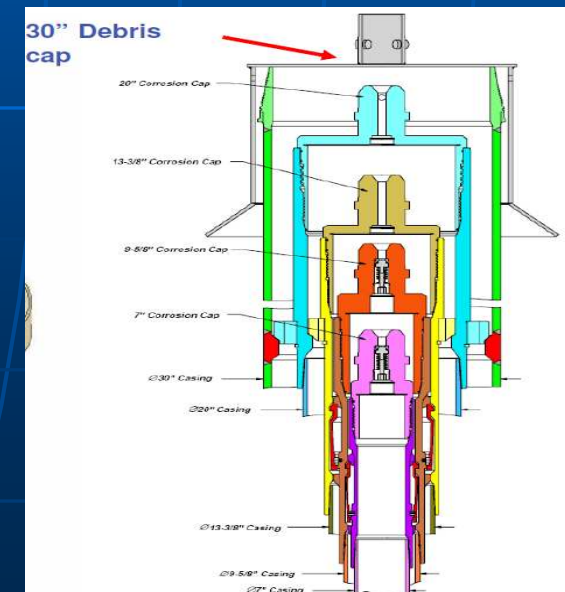
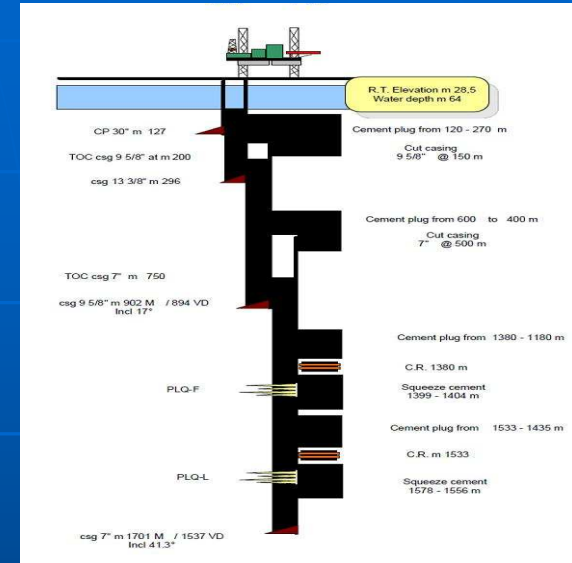
- CIRCULATE BOTTOMS UP AT NORMAL FLOW RATE WITH BOP OPENED. CHECK CAREFULLY PIT LEVEL

THE WELL FLOW

- INSTALL THE STAND-BY FULL OPEN SAFETY VALVE (KELLY COCK)
- CLOSE KELLY COCK
- OPEN VALVE ON CHOKE LINE
- CLOSE ANNULAR BOP
- CHECK CHOKE POSITION (CLOSED)
- IF NEEDED, CLOSE APPROPRIATE PIPE RAMS
- OPEN THE HYDRAULIC OPERATED VALVE (HCR) ON CHOKE LINE
- IF THE POWER CHOKE IN USE IS NOT A POSITIVE SEAL CHOKE, CLOSE MANUAL VALVE BEHIND CHOKE
- RECORD TIME, SICP, AND KICK VOLUME (PIT GAIN)
- INSTALL TOP DRIVE OR KELLY AND PRESSURE TEST
- OPEN THE KELLY COCK
- RECORD SIDPP
- PREPARE TO KILL THE WELL

P & A – EXPLORATION WELLS

- Abandoning at the end of Drilling in case of dry well (OH) (Permanent)
 - Cover all permeable zones in OH (Ø 8 ½") w/cement plug
 - Set cement plug 150-200m above 9 5/8" csg shoe
 - Cut 9 5/8" csg above TOC or 150m b. m.l.;
 - Set surface cement plug : 320-120m
 - Replace mud w/sea water
 - Cut 13 3/8" & 30" CP cca 2-3m below mud line
- Abandoning tested levels in 7" csg:
 - For each tested level, set cement retainer & squeeze cement in perfs, set cement plug above cca 150m;
 - Cut 7" csg above TOC; set cement plug cca 200m, overlapping 7" csg & 9 5/8" csg per 100m;
 - Same as a.m.
- In case of MLS /Mud Line Suspension) : Temporary
 - Each tested interval : Bridge plug & Cement plug above cca 150m;
 - Set cement plug within 7" csg cca 150-200m;
 - Back off & POOH the MLS running tool 7" csg & RIH corrosion cap;
 - Back off & POOH the MLS running tool 9 5/8" csg & RIH corrosion cap;
 - Back off & POOH the MLS running tool 13 3/8" csg & RIH corrosion cap;
 - Back off / Cut cca 2-3 m above m.l. & POOH the MLS running tool 30" CP & RIH debris cap



CROATIAN OFFSHORE SAFETY REGULATIONS FOR DRILLING & COMPLETION OPERATIONS

" Regulations on main technical requirements,safety and protection during exploration and production of liquid and gaseous hydrocarbons from Croatian Offshore" ; "Official Gazette" 05/10; 2nd edition

GENERAL FROM AUTHORITY APPROVAL :

- Main Mining Project for Offshore Drilling Rig by INA
- Main Mining Project for Well Operations by INA
- Environmental Impact Study by INA
- Concession licenses
- Well location permit

OPERATING COMPANY:

- Simplified Technical Project (Geological, Drilling, Well testing / Completion Programs)
- Emergency Response Plan (consider all Safety & HSE aspects for drilling & completion operations)
- All relations w/local marine authority
- Drilling & Completion Fundamental, Policies, Guidelines (Manual)
- Strictly follows Croatian Offshore Regulations

DRILLING CONTRACTOR COMPANY:

- Offshore Drilling Rig Safety Manual (fulfill all aspects of Safety & HSE procedures during drilling & completions operations)
- Strictly follows Croatian Offshore Regulations

CONCLUSION

IN DRILLING:

- Batch mode drilling for rig time saving
- Suspension the exp. well at mud line for future tie-back and completion
- Water base mud (Poly, Drill in fluid) w/environmental friendly additives
- High sophisticated directional drilling tools (Steerable rotary drilling systems, PDM, MWD, LWD)
- Newest generation of logging tools

IN COMPLETION:

- Dual completion system
- Carbonate isolation system (tail completion vs. upper sand layers to be completed)
- Gravel pack technique: horizontal OH, HRWP, Frack & Pack
- Multizonal gravel pack tool (mini beta system)
- Fluid loss control using double pin sub completion technique (long string) and SAF valve (short string)

...CONCLUSION

OVERALL:

- According to the well test results, all expected start-up gas rate per wells have been achieved
- Improvement of well productivity expected in first few months of production
- Ultimate recovery has increased as a function of number of developed reservoirs due to applied modern well technology
- In the same time, number of required wells enabled optimizing number and design of production platforms



***THANK YOU FOR
ATTENDANCE!***

Questions?