



How to maximize the value of mature HC fields?

Workshop

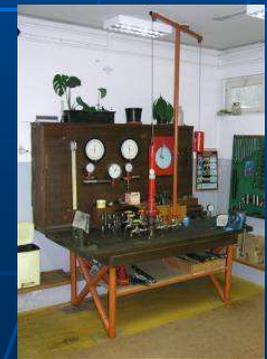
Budapest, 18. November 2010.

Society of Petroleum Engineers

**The role of Šandrovac gas-lift workshop
in reducing maintenance costs and increasing production
of mature oil fields in INA**

Gas-lift workshop history

- 1962 - The first workshop for the servicing of gas lift valves - M. Brdo
- 1973 - Šandrovac - Workshop for servicing gas-lift equipment getting started
- 1973 – Implementation of new valves types, for continuous and intermittent gas-lift LM-15R, WFM-14R and TC
- 1983 - The first gas-lift workshop at M. Brdo was closed
- 1983 - Procurement of the majority of valves that are now in use: WF-14R, LM-16R, L-12R,....
- 1985 - A new test bench with the equipment
- 1998-2004 - A large number of innovations and adoption of domestic production
- Production of technical drawings for all gas-lift equipment
- 2003-2004 - the first domestic production of valves and equipment



- Workshop serviced equipment for 276 oil wells, at 12 oil fields, which is about 41% of all oil production in Croatia.
- Two employees and support of an engineer for specifications, plans.....
- Maintenance cost (supplies, employees, utilities for el. power, water....) – 40.000 \$/year
- Period of servicing and adjusting valve – one day
- Service cost for valve – from 120 to 800 \$ (spare parts)
- Yearly serviced 140 valve and 400 pieces of other gas-lift equipment within the 50 workover and 30 wire-line works.



- 10 types of valves and more than 40 other equipment.

- Price of domestic valve – 2.600 \$
price of imported valve – 4.000 to 5.000 \$

- used for education and training students, technicians, engineers and foreign delegations



- cross sections of equipment—simulations of work in real conditions.



- This is the only workshop of that kind in this area of Europe, which opens the possibility of placement services and equipment outside the Croatian borders.



Gas-lift equipment

INTERMITTENT GAS-LIFT VALVES



WF-14R

NPV-1

NPV-2

CONTINUOUS AND INTERMITTENT GAS-LIFT VALVES



J-40

TIN-1

CONTINUOUS GAS-LIFT VALVES



L-12R

LM-16R

LM-16

LN-20R

SEATING NIPPLES



SURFACE CATCHER



MANDRELS



CHABER



MOTOR VALVES



ORIFICE FLOW CONTROL



TIMER



LATCHES



STANDING VALVES



PARAFIN CLEANERS



PLUNGER GAS LIFT EQUIPMENT

Examples for maintenance reduction and increasing production .

- Writing and publishing of Gas-lift equipment catalog
- Developing and production of technical documentation
- Adoption of domestic production - modern materials
- New innovations and equipment upgrade
 - Central pocket mandrel CV-1
 - Gas-lift chamber KCV-2
 - Gas-lift valve TIN-1



P.P. VENTIL PPV-CV-1



Legenda:

Prsten	11
Glava	10
V-Brtva	9
Nosač V brtvi	8
O-Prsten	7
Čep izlazne komore	6
O-Prsten	5
Klip	4
Sjedilne kugle	3
Zaporna kugla 3/4"	2
Izlazna komora	1

Central pocket mandrel CV-1

- Low cost domestic product
- Used in a deviated wells
- valve is located in the center of the production string
- valve can always be installed and pull out
- no costs of extra workover
- Can be used for intermittent and continuous gas-lift
- the cost of producing CV-1 - lower than the price of side pocket mandrel - reduces costs of equipping the well.

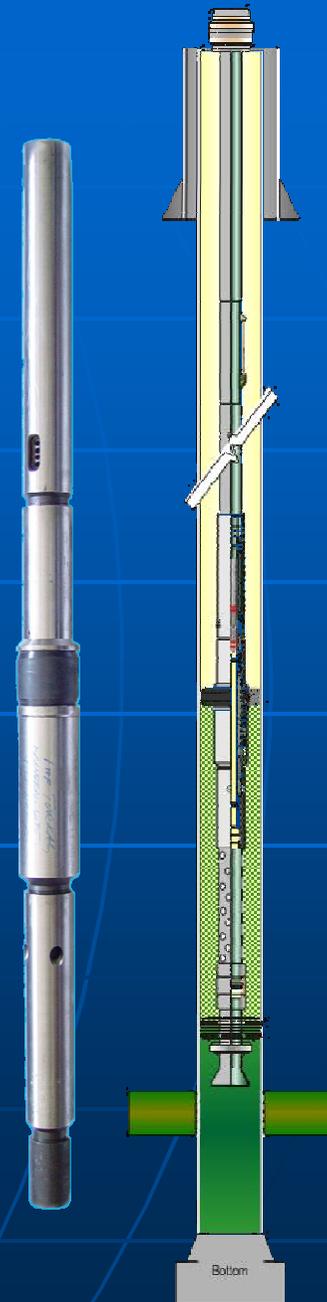


Gas-lift chamber KCV-2

- completely new domestic product
- used for chamber gas-lift
- In wells with low dynamic pressure
- minimum depression with maximum production
- the entire casing between two packers is chamber
- increasing of production
- reduced cost of well equipping

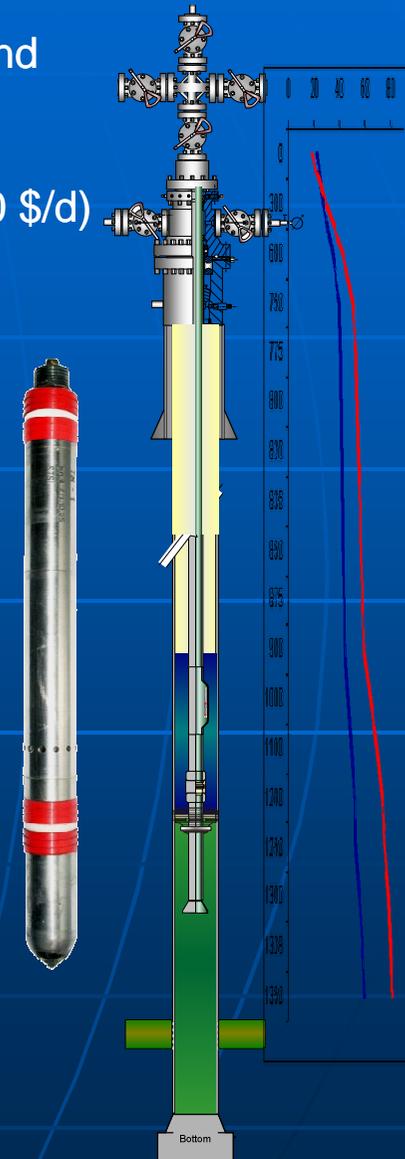
price of domestic chamber – 12.000 \$

price of imported chamber – 24.000 \$



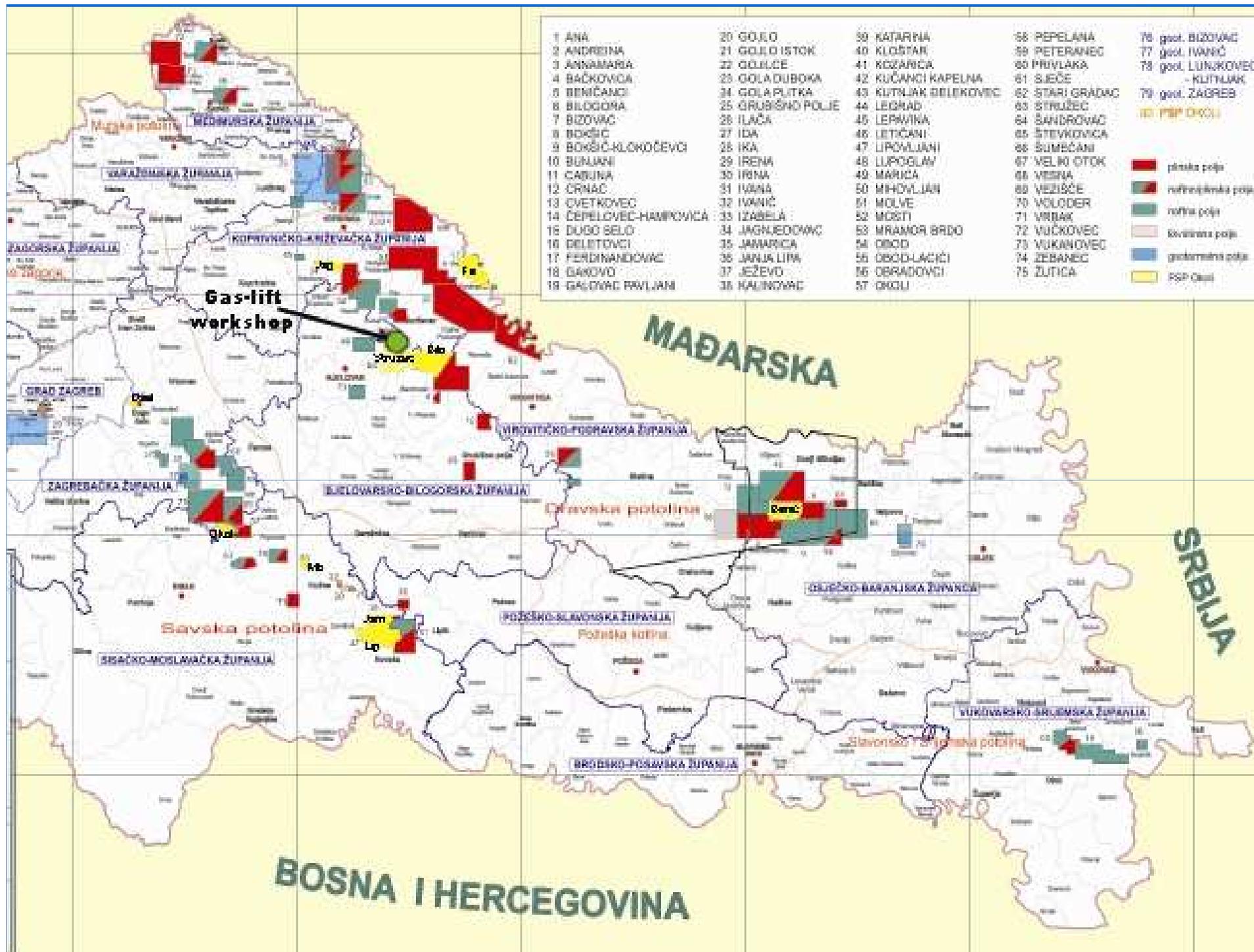
Injection gas-lift valve TIN-1

- Well with high GOR, high pour point (23°C), long pipeline (10 km) and paraffin
- Work with existing installed equipment – high production cost (1.500 \$/d)
 - a lot of equipment - heater, separator, two injection pumps.....
 - injecting chemicals on the surface and casing
 - low efficiency (pour point 16°C)
 - well can't work trough winter time – loss of a production
- Design with a new type of valve TIN-1
 - Cost reduction – no heater, separator....
 - injection of chemical only in casing at optimal depth and temp.
 - high efficiency (pour point 0 to -8°C)
 - well can work trough winter period
 - low production cost (150 \$/d)



From this we can conclude that the role of gas-lift workshop is not irrelevant in reducing maintenance costs and increasing production at mature oil fields, and that with the inventive work of employees, experts and the constant upgrading of existing equipment can be achieved great results, even with the old equipment.

THE END



1 ANA	20 GOLEO	39 KATARINA	58 PEPELANA	76 grad. BIZOVAC
2 ANDREJNA	21 GOLEO ISTOK	40 KLOŠTAR	59 PETERANEC	77 grad. IVANIČ
3 ANNAMARIA	22 GOLJICE	41 KČARICA	60 PRIVLAKA	78 grad. LUNJKOVEC -
4 BACKOVA	23 GOLA DUBOKA	42 KUČANCI KAPELNA	61 SJEČE	- KUTLJAK
5 BENEČANI	24 GOLA PUTKA	43 KUTLJAK BELEKOVEC	62 STARI GRADAC	79 grad. ZAGREB
6 BILOGORA	25 GRUŠIŠNO POLJE	44 LEGRAD	63 STRUŽEC	
7 BIZOVAC	26 ILAČA	45 LERVINA	64 SANDROVAC	PSP OKOLI
8 BOKŠIĆ	27 IDA	46 LETIČANI	65 ŠTEVKOVICA	
9 BOKŠIĆ-KLOKOČEVO	28 IKA	47 LIPOVLJANI	66 ŠUMECANI	pinka poja
10 BUNJANI	29 IRENA	48 LIPOGLAV	67 VELIKI OTOK	redna poja
11 CABUNA	30 IRINA	49 MARICA	68 VESNA	green poja
12 CRNAC	31 IVANA	50 MIHOVLJAN	69 VEZIŠĆE	light pink poja
13 CVETKOVEC	32 IVANIČ	51 MOLVE	70 VOLODER	blue poja
14 ČEPELOVEC-HAMPOVICA	33 IZABELA	52 MOSTI	71 VRBAK	yellow poja
15 DUGO SELO	34 JAGJEDOVAC	53 MRAMOR BRDO	72 VUČKOVEC	
16 DELETOVCI	35 JAMARICA	54 OBOD	73 VUKANOVEC	
17 FERDINANDOVAC	36 JANJKA LIPA	55 OBOD-LACIĆI	74 ZEBANEC	
18 ĐAKOVO	37 JEŽEVO	56 OBRADOVCI	75 ŽUTICA	
19 GALDVAČ PAVLJANI	38 KALINOVAC	57 OKOLI		