



CONFIND

CGA

ASSOCIATED GAS COMPRESSOR

CGA – CONFIND's compressor for associated gas

GENERAL PRESENTATION

SC Confind developed a new product – the CGA compressor. The first manufactured and installed trial units confirmed the expectations, including endurance.

CGA is an associated gas compressing system, meant to increase the oil well production by decreasing gas back pressure in the well casing and pumping that gas in the oil flow line or to a local user.



*CGA 8x56 System
OMV Petrom oil well
Zemeş – Taşbuga formation*

CGA – CONFIND's compressor for associated gas

GENERAL PRESENTATION



March 2010

*The CGA prototype system,
in-house tests on a 7 tons pump
jack produced by CONFIND*

Basically, the CGA system consists of a gas compressor cylinder, special clamps to attach it to the pump jack and the hoses & piping system up to the pumping jack skid limit. The compressor piston is driven by the beam of the pump jack.

Electronic temperature monitoring and automatic overheating protection system is included.



GENERAL PRESENTATION



The main reasons why
SC Confind decided to develop
the CGA product



- ❖ Confind policy of predictive adjustment of its production to the necessities of the oil and gas industry operators;
- ❖ Technical capability to develop new products;
- ❖ Large experience and technological capacity in manufacturing equipment for the oil and gas industry;
- ❖ Outstanding availability to provide technical assistance, spare parts and also maintenance for its products.

The system and its components are designed and manufactured by
Confind.

VERSIONS and MODELS

The version of a CGA System is determined by the compressor cylinder bore. A version includes different models, characterized by the piston stroke. Three of the foreseen versions (6", 8" and 10" bore) are already in production.

- **CGA 6xXX Version**
(6" bore x XX" stroke)
is targeting mainly pump jacks up to 5 tons pump jacks

The CGA prototype, a **CGA 6x36** model is functioning since 23rd of July 2010 with an oil well pump jack in OMV Petrom Moreni - Dealul Bătrân formation

*First prototype check
(2 hours, during an scheduled oil well stop).*



VERSIONS and MODELS

- **CGA 8xXX Version**
(8" bore x XX" stroke)
is targeting mainly pump jacks in the
7 to 12 tons range
Two units were installed in Moinești area:

CGA 8x36 Model (8" bore x 36" stroke)
- in function since 2nd of May 2011 with a
pump jack, Pietrosu formation
- the casing of other two oil wells in the
close vicinity are connected to the same
CGA system

CGA 8x56 Model (8" bore x 56" stroke)
- in function since 4th of February 2011,
Tașbuga formation



*CGA 8x56 installation on a pump
jack, Tașbuga formation*

CGA – CONFIND's compressor for associated gas

VERSIONS and MODELS

- ▣ **CGA 10xXX Version** (10" bore x XX" stroke)
is targeting mainly pump jacks in the 12 to 15 tons range
Now several units are under manufacturing for each of the following models
CGA 10x36 Model (10" bore x 36" stroke)
CGA 10x48 Model (10" bore x 48" stroke)
CGA 10x64 Model (10" bore x 64" stroke)



CGA 8x36 working with a pump jack, Pietrosu formation

VERSIONS and MODELS

- In order to provide a rough selection guide for the potential customers, please find below the production range availability:

BORE	STROKE	GAS FLOW [Nm ³ /day] / POWER [kW]
6"	36", 48"	up to 400 / 0.6÷0.9kW
8"	36" , 48", 56"	500 to 1000 / 1.1÷1.8kW
10"	36" , 48" , 56", 64"	600 to 1800 / 1.7÷3.2kW
12"	48", 56", 64", 72"	1800 to 2700 / 3.3÷5.1kW
14"	48" , 56", 64" , 72"	2400 to 4000 / 4.5÷6.9kW

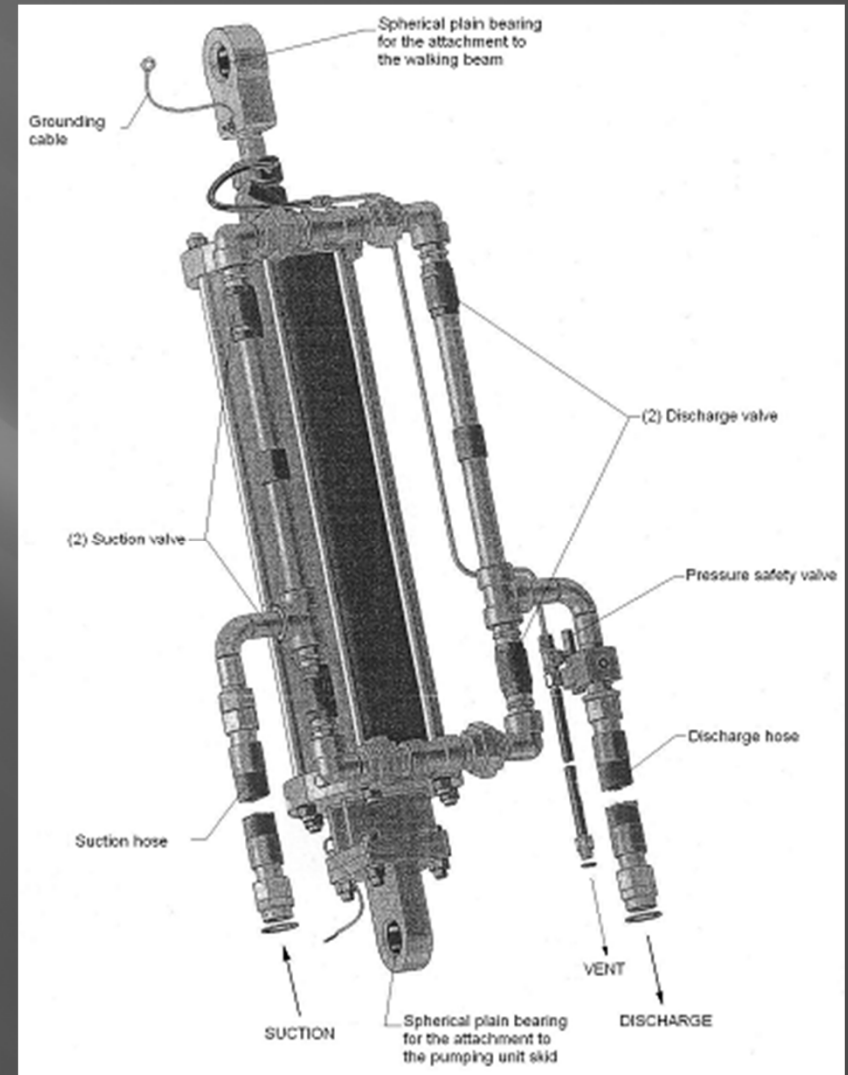
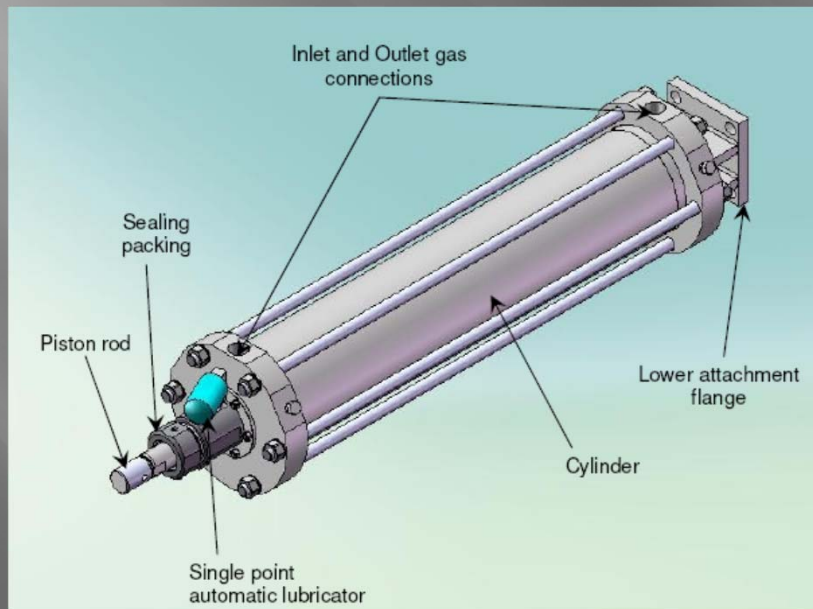
*For:
0.5 bar in the well casing,
4 bar in the discharge line,
6 double strokes per
minute of the pump jack.*

*In **bold** the usual versions and models, able to respond to the necessities in Romania.*

Due to the large variety of operation conditions: operating schedule, gas flow, casing pressure (actual and desired), oil flow line pressure, pump jack model, sucker rod stroke, no. of double strokes per minute, it is highly recommended to consult the CGA producer in order to select the most efficient solution for each application.

DELIVERABLES and OPTIONS

- Compressor cylinder, factory assembled and equipped with:
- - upper and lower clevises with spherical plain bearings
- - suction and discharge valves
- - pressure safety valve
- - single point automatic lubricator
- - connection hoses



DELIVERABLES and OPTIONS

- ❑ Special clamps for easy attachment and detachment of the compressor cylinder to the pump jack. Non-restricted movement during operation is provided by the spherical bearings on the compressor cylinder.
- ❑ Piping system up to the pump jack skid limit with the necessary equipment: coarse suction filter, isolation and bypass valves, check valve, pressure and temperature gauges.



DELIVERABLES and OPTIONS

- Electronic temperature monitoring and automatic overheating protection system for three characteristic temperatures (RTD sensors). The control panel has to be installed close to the power supply panel of the pump jack and has to be connected to it.



DELIVERABLES and OPTIONS

- Optional equipment:
 - Liquid separator (scrubber) for the gas entering the CGA System - to be installed on the gas line from the well casing to the pump jack skid limit (gas line provided by the customer)
 - Pressure regulator to provide a minimum pressure in the well casing as required by the customer
 - Gas flow meter for the flow pumped from the well casing



- Technical assistance for the CGA System installation, commissioning, maintenance and monitoring can be provided upon request.

SELECTION of the CGA SYSTEM

- The efficiency of the system highly depends on the equality between the gas flow produced by the formation at the desired pressure in the well casing, to the compressor cylinder capacity to pump that flow in the discharge line.

The gas flow depends on the formation and on the pressure in the casing.

The compressor capacity depends on:

- Cylinder dimensions, namely bore and stroke
 - The number of double strokes per minute of the pump jack
 - The working schedule of the well pump jack
 - The gas pressure at the compressor cylinder suction connection
 - The pressure ratio to be realized by the compressor cylinder
- The pump jack stroke and the pressure in the discharge line give the limits.
- The best results may be obtained by selecting a CGA System from the preferential versions-models, taking into consideration the specific conditions of each application.

SELECTION of the CGA SYSTEM

As a guide, bellow are the flows [Nm³/day] handled by three CGA models – double action cylinders, for different gas pressures in the casing and different double strokes per minute of the pump jack, 4 bar discharge pressure.

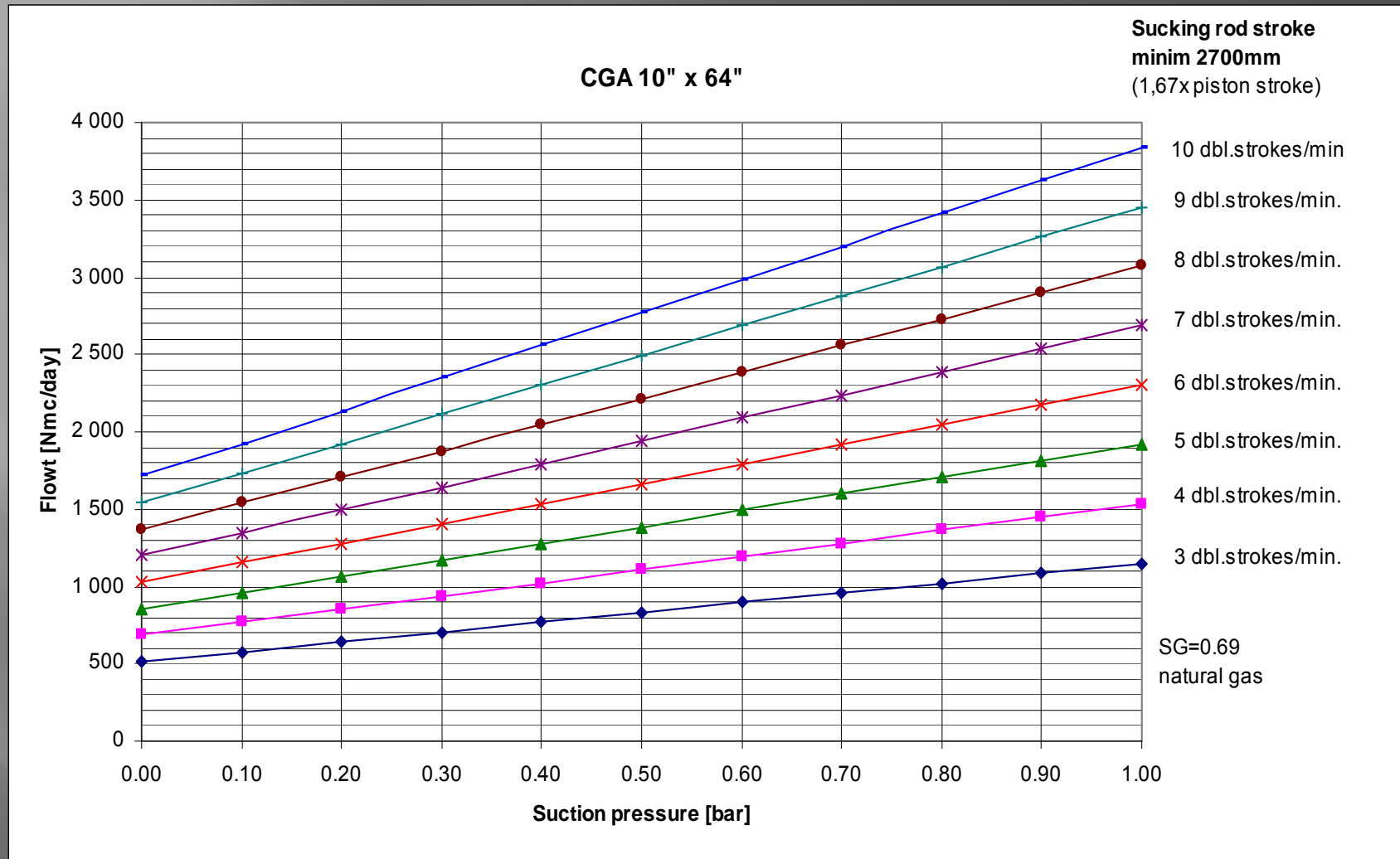
dbl. strk. per min.	CGA 8x36					CGA 10x48					CGA 14x64				
	Steady pressure in the well casing [bar]														
	0.00	0.25	0.50	0.75	1.00	0.00	0.25	0.50	0.75	1.00	0.00	0.25	0.50	0.75	1.00
1	54	73	92	111	131	122	162	202	242	283	339	443	548	654	760
2	108	146	184	222	261	244	323	403	484	565	678	887	1 096	1 308	1 520
3	162	218	276	334	392	367	485	605	726	848	1 018	1 330	1 645	1 961	2 280
4	216	291	368	445	523	489	647	807	968	1 130	1 357	1 773	2 193	2 615	3 039
5	270	364	460	556	653	611	809	1 009	1 210	1 413	1 696	2 216	2 741	3 269	3 799
6	324	437	552	667	784	733	970	1 210	1 452	1 695	2 035	2 660	3 289	3 923	4 559
7	378	510	643	779	915	855	1 132	1 412	1 694	1 978	2 374	3 103	3 838	4 577	5 319
8	432	582	735	890	1 045	977	1 294	1 614	1 936	2 260	2 714	3 546	4 386	5 230	6 079
9	486	655	827	1 001	1 176	1 100	1 456	1 815	2 178	2 543	3 053	3 990	4 934	5 884	6 839
10	539	728	919	1 112	1 307	1 222	1 617	2 017	2 420	2 825	3 392	4 433	5 482	6 538	7 599
11	593	801	1 011	1 223	1 437	1 344	1 779	2 219	2 662	3 108	3 731	4 876	6 031	7 192	8 358
12	647	874	1 103	1 335	1 568	1 466	1 941	2 421	2 904	3 390	4 070	5 319	6 579	7 846	9 118
13	701	946	1 195	1 446	1 698	1 588	2 103	2 622	3 146	3 673	4 410	5 763	7 127	8 499	9 878
14	755	1 019	1 287	1 557	1 829	1 710	2 264	2 824	3 388	3 955	4 749	6 206	7 675	9 153	10 638
15	809	1 092	1 379	1 668	1 833	1 833	2 426	3 026	3 630	4 238	5 088	6 649	8 223	9 807	11 398

Highlighted flow for the usual ranges of pump jacks double strokes per minute and desired well casing pressure.

SELECTION of the CGA SYSTEM

- ▣ For a certain pressure in the well casing, the required pressure ratio is enforced by the CGA System discharge back-pressure which is mainly imposed by the pressure in the customer discharge line. The maximum safe pressure ratio is **5,0-5,5** due to the system components overheating risk. That may enforce a limit in selecting the desired pressure in the well casing.
- ▣ It is not an efficient approach to tailor and design a new system for each case. That is why we are recommending a limited number of models. Confind already developed three versions in more models and, according to future requests is ready to diversify the range.
- ▣ Once the most suitable model for a specific case is selected, taking into consideration the future evolution of the formation too, there are available some adjustment solutions:
 - **rough ones** – transform the compressor from a double acting to a simple acting one or vice-versa due to big changes of parameters over time
 - **tuning ones** – adjust the end clearances of the compressor by changing the position of the attachments to the pump jack

SELECTION of the CGA SYSTEM



Computed Capacity versus Suction pressure diagram for a CGA model. Similar ones are available for all the models.

ADVANTAGES of UTILIZING a CGA SYSTEM

- Easy to install on any pump jack type with no adjustment of it. A day should be enough to install a CGA System.
- The compressor acts as a shock absorber. Usually no re-balancing on the pump jack is needed after a CGA installation.
- Safe, noiseless, no residue. CGA is equipped with a pressure safety valve and an automatic overheating protection system;
- Current operating CGA includes just a few minutes visual inspection when such work is scheduled for the pump jack;
- No oil lubrication system. Low maintenance, no adjustment required.

ADVANTAGES of UTILIZING a CGA SYSTEM

- ▣ Special treatments in the well casing may be performed without restrictions on CGA behalf. If needed, the compressor may be turned on bay-pass functioning mode;
- ▣ No need for a separate gas line to recover the gas in the casing. By injecting it in the oil flow line, the gas goes to the same separation facility where already exists the installations to separate it from the oil;
- ▣ Enhances the oil flow in the line by lowering the oil viscosity. Also, the heat transfer from the compressed gas reduces the freezing and deposits development;

ADVANTAGES of UTILIZING a CGA SYSTEM

- At request, Confind is providing the installation of CGA on the pump jack and also the maintenance work;
- SC Confind – local producer, is always available for the Customer to select the optimum solutions, to provide technical assistance, spare parts and other services.

