CASE STUDIES. The following are two case studies, where the Don-Nan Gas Separator provided a solution for gas problems within an oil well:

Case Study #1: Lufkin Automation. Before installing the packer type gas separator, dynamometer results retrieved from the Lufkin SAM well manager revealed severe gas interference. This prevented the pump from filling properly a large percentage of the time resulting from poor downhole gas separation. Pump intake pressure analysis also derived from the SAM well manager dynamometer data and fluid level data performed by Lufkin Automation personnel revealed a PIP of 750 psi. This suggested that current conditions would not allow the well to be pumped off. Well test results at this time showed oil at 12 BPD, water at 82 BPD, and gas production at 100 MCFGPD.

After installing the packer type gas separator, dynamometer data and run time data retrieved from the Lufkin SAM well manager revealed 100% fillage of the pump and 100% run time. Pump intake pressure analysis from dynamometer data revealed a PIP of 400-450 psi, concurring that the well was now able to be pumped down, suggesting that proper down hole gas separation was now occurring. Well test results after the installation of the packer type gas separator showed oil production at 42 BPD, water at 162 BPD, and gas at 213 MCFGPD.

Estimated production increase returns are based on conservative figures of $55 per barrel for oil and $5/MCF for gas:

Oil:
Before gas separator installation—12 BPD
After gas separator installation—42 BPD (average oil production for the 1st 30 days)
Resulting in 30 BPD increase of $1650 per day

Gas:
Before gas separator installation—100 MCFGPD
After gas separator installation—213 MCFGPD (average gas production for 1st 30 days after installation)
Resulting in 113 MCFGPD increase of $565 per day

Total production increase= $66,450 in increased revenue for the 1st 30 days

Now, having the ability to pump the well off will in turn yield maximum production and allow the well to cycle on the pump off controller. This will allow savings on power (well will not run when pumped off or severely over-displaced), and minimize wear and damage to the surface equipment, rod string, and down hole pump, resulting in additional monetary savings on electricity, repairs and maintenance.

Case Study #2: Independent Pump Co. IPC has worked in collaboration with their customers and suppliers to assist in innovating pumping solutions to reduce downtime and increase profitability.

Before installing the packer type gas separator, the well was carrying a large gaseous fluid column. Manual foam depressions indicated that incremental production was available, but the bottom hole pump was unable to operate efficiently due to the intake of gas.

Before the separator was installed, the pump efficiency was observed to be 30% with oil at 100 BPD, water at 50 BPD, and gas at 190 MCFGPD. Immediately after installing the gas separator, the pump efficiency had increased to 60% with oil at 178 BPD, water at 96 BPD, and gas at 373 MCFGPD.

Estimated production increase returns are based on conservative figures of $55 per barrel for oil and $5/MCF for gas:

Oil:
Before gas separator installation—100 BPD
After gas separator installation—138 BPD (average oil production for the 1st 30 days)
Resulting in 38 BPD increase of $2090 per day

Gas:
Before gas separator installation—190 MCFGPD
After gas separator installation—279 MCFGPD (average gas production for the 1st 30 days)
Resulting in 89 MCFGPD increase of $445 per day.

Total production increase = $76,050 in increased revenue for the 1st 30 days.

The well has continued to produce with increased pump efficiency resulting in increased production and incremental revenue.

Table 1

Gas separator maximum capacity based on bubble rise velocity

S no.	Gas Separator (in inches)	Casing size (in inches)	Max capacity of GS (in BPD)	Max capacity at 80% Efficiency (in BPD)
1	2 3/8	4 1/2	382	305
2	2 3/8	5 1/2	738	590
3	2 7/8	4 1/2	261	208
4	2 7/8	5 1/2	618	494
5	2 7/8	7	1291	1032
6	3 1/2	5 1/2	438	350
7	3 1/2	7	1110	888
8	3 1/2	7 5/8	1448	1158
9	3 1/2	8 5/8	2107	1685
10	4	7 5/8	1366	1092
11	4	8 5/8	2025	1620
12	4	9 5/8	2668	2134

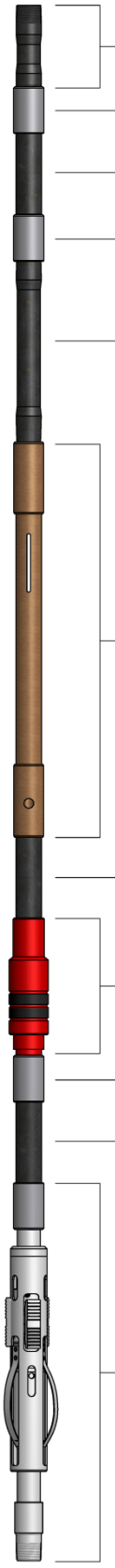
Table 2

Inner tube liquid capacity

Inner tube size (in inches)	Inner tube description	Capacity (in BPD)*
1	1.315 X 1.049 SCH 40	630
1 1/4	1.660 X 1.380 SCH 40	1350
1 1/2	1.990 X 1.610 SCH 40	1930

*Water capacities cause a pressure drop of 0.5 PSI in 7 feet of standard schedule 40 line pipe or 7 feet of thin-wall, schedule 10, seamless, 316 stainless steel.

DON-NAN
GAS SEPARATOR
DOWN HOLE ASSEMBLY



RUN 1 X 12" STRAINER NIPPLE ON PUMP

Don-Nan