



## WELL STIMULATION USING NITROGEN INJECTION



# INTRODUCTION TO NITROGEN INJECTION TECHNOLOGY



**Nitrogen injection** is a proven and efficient method for **well stimulation** and production enhancement in the oil and gas industry. By introducing nitrogen gas into the wellbore, the hydrostatic pressure of the fluid column is reduced, allowing hydrocarbons trapped in the reservoir to **flow more easily** to the surface.

Physically, **nitrogen reduces the density and viscosity** of the well fluids and helps displace liquid phases such as water, heavy crude, or emulsions. Chemically, nitrogen is **inert and non-reactive** with hydrocarbons or reservoir rock, preventing corrosion and undesired reactions that could alter formation properties.

This process also helps clean up wells with liquid loading, enables safe pressure control during maintenance, and prevents oxidation by displacing oxygen in pipelines and process equipment.

## Why Nitrogen?

- Inert and non-corrosive gas
- Non-flammable, ensuring operational safety
- Easily generated on site via membrane or PSA systems
- Low cost and minimal logistical requirements
- Environmentally friendly and versatile for multiple applications







## TYPICAL OILFIELD APPLICATIONS

- Stimulation of wells in low-permeability reservoirs
- Temporary gas lift to assist production
- Well cleanup in cases of high liquid accumulation
- Inerting pipelines and equipment before maintenance
- Pressure control during hydraulic fracturing operations

## BOOST WELL PERFORMANCE INJECT EFFICIENCY WITH NITROGEN



SAFETY



EFFICIENCY



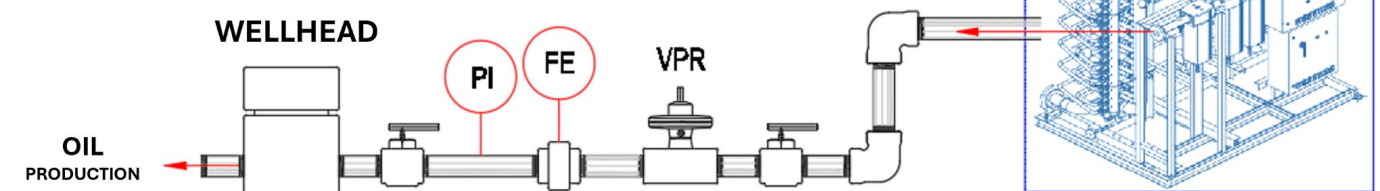
PRESSURE

## BENEFITS FOR YOUR OPERATIONS

- Immediate boost in hydrocarbon production
- Reduced well intervention time
- Improved secondary recovery efficiency
- Lower environmental risks
- Cost-effective solution for mature or marginal fields

## OPERATIONAL ADVANTAGES

- On-site nitrogen generator: no need for cryogenic supply or delivery
- High availability: suitable for remote sites or areas lacking infrastructure
- Compact, modular design: easy to transport and install
- Continuous and safe operation: no risk from stored pressurized gas
- Reduced operating costs: simplified logistics and lower maintenance



Connection of the N<sub>2</sub> injection line to the wellhead

# MEMBRANE TECHNOLOGY

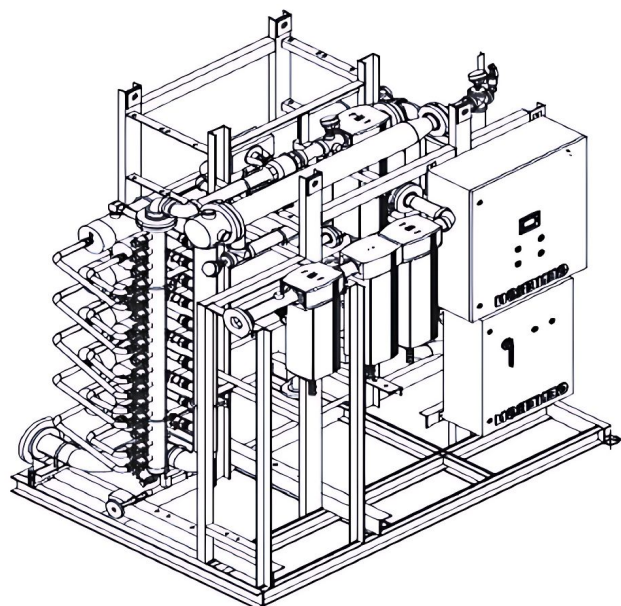


## Operating Principle

Membrane nitrogen generation is based on the selective permeability of gas molecules through hollow polymer fibers. Compressed, clean, and dry air enters the membrane module, where oxygen, moisture, and trace gases permeate through the fiber walls faster than nitrogen. The remaining gas stream, rich in nitrogen, exits the module as the final product.

## Advantages

- Robust and simple design with no moving parts
- Fast start-up and continuous nitrogen production
- Adjustable purity up to 95-97%, ideal for most oilfield applications
- Compact, modular, and containerized systems for field deployment
- Low maintenance and long service life

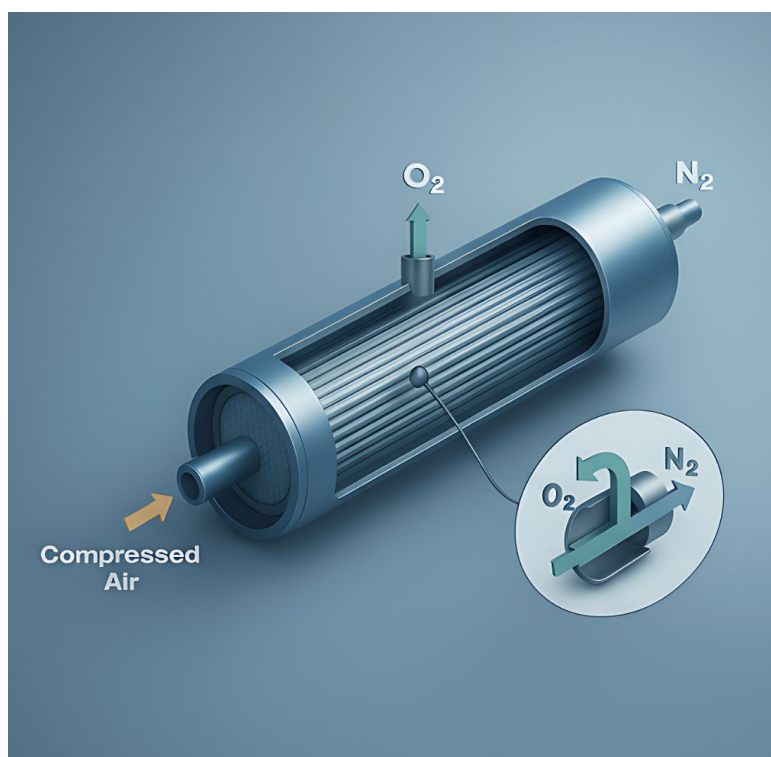


## Typical Applications

- Well stimulation and cleanup
- Temporary gas lift and inertization
- Pressure control in hydraulic fracturing
- Purging of pipelines and process systems

## Limitations

For processes demanding very high nitrogen purity (above 95–97%), membrane systems may become less efficient. In such cases, PSA systems are the preferred option.



# PSA (PRESSURE SWING ADSORPTION) TECHNOLOGY



## Operating Principle

PSA technology relies on twin adsorption vessels filled with carbon molecular sieves (CMS). As compressed air passes through, oxygen and trace gases are selectively adsorbed while nitrogen passes through as the product gas. The system alternates between adsorption and regeneration cycles to ensure a continuous supply.

## Advantages

- Nitrogen purity up to 99.999%
- High stability and pressure for sensitive applications
- Energy-efficient with automatic cycle control
- Containerized modular systems for easy installation
- Designed for continuous, heavy-duty industrial use

## Applications

- Enhanced oil recovery (EOR)
- Reservoir pressurization
- Chemical and petrochemical industries
- Environments requiring ultra-high purity





# TECHNICAL FEATURES

## Technical data

			N2PSA						N2PSA+					
Product Category			PCT			PPM			PCT			PPM		
Nitrogen Purity %			99,000	99,500	99,900	99,950	99,990	99,999	99,000	99,500	99,900	99,950	99,990	99,999
Air ratio			2.8	3	3.8	4.2	5	7	2.8	3	3.5	3.8	4.4	6.5
Product model	Dimensions (L*W*H) mm	Weight kg	Nitrogen Production Capacity (Nm³/h)											
80300002	1800*950*1915	1100	23	21	15	12	10	6	25	23	17	14	11	9
80300004	2100*1000*1915	1350	46	42	29	23	20	11	49	45	32	26	22	17
80300006	2300*1100*2380	1800	69	64	44	34	29	17	74	69	49	39	31	26
80300009	2650*1200*2450	2000	100	93	64	50	43	25	107	100	71	57	47	38
80300010	2780*1200*2590	2300	114	106	73	57	49	29	122	114	81	65	53	44
80300013	2730*1200*2820	2700	143	133	92	71	61	36	153	143	102	80	66	54
80300016	3200*1450*2905	3200	191	177	122	95	82	48	205	191	136	108	89	72
80300020	3330*1650*2905	3600	238	221	153	118	102	60	255	238	170	134	111	90
80300024	3450*1650*3200	4000	280	260	180	139	120	70	300	280	200	158	130	105
80300030	3750*1650*3200	5000	366	340	235	182	157	91	392	366	261	206	170	137
80300036	4200*2000*3200	5500	440	408	283	219	188	110	471	439	314	248	204	165
80300045	4300*2000*3200	6000	510	473	327	253	218	127	546	509	364	287	236	191
80300055	4350*2000*3520	6500	579	537	372	288	248	145	621	579	413	326	269	217
80300065	4650*2200*4190	8000	715	663	459	355	306	179	766	714	510	403	332	268
80300080	4800*2200*4280	10000	935	867	600	464	400	233	1002	934	667	526	433	350
80300110	5150*2800*4150	12000	1295	1198	767	594	511	298	1280	1193	852	673	554	447
80300130	5600*2800*4350	14000	1402	1300	900	697	600	350	1502	1400	1000	790	650	525

Product model	80224090	80224160	80224200	80224320	80224480
N <sub>2</sub> Purity (FDA)	Nm³/h	Nm³/h	Nm³/h	Nm³/h	Nm³/h
95%	960	1685	2010	3200	4800
96%	920	1840	1920	3090	4622
97%	810	1620	1690	2720	4060
98%	720	1450	1510	2430	3630
99%	575	1160	1200	1945	2900
99.9%	275	555	580	940	1400



## TECHNICAL FEATURES

### Available Equipment

Typical portable skid for nitrogen injection — **modular assembly**, easily transported by 4x4 truck, light vehicle, or trailer. Designed for reliable, continuous operation in oilfield and industrial environments.

### Pressure and Flow Capacities

- Customizable to meet project requirements.
- Systems are built to handle a **wide range of pressures and flow rates** while maintaining stable nitrogen purity.

### Stable and Reliable

- Proven and advanced technology, validated in field operations
- High-quality components ensure long-term performance
- Multiple online monitoring and protection systems
- Capable of operating efficiently under various loads and environmental conditions

### Intelligent Control

- Smart PLC control system
- Optional intelligent monitoring supporting remote communication
- One-click start/stop operation
- Automatic standby mode when nitrogen demand is low



## TECHNICAL FEATURES

### Rich Configurations

- Monitoring of oxygen content, dew point, flow rate, and pressure (standard or optional)
- Continuous online monitoring and automatic adjustment of nitrogen purity

### Leading in Energy Efficiency

- Nitrogen purity can be set and adjusted according to operational needs
- Optimized control ensures minimum energy consumption per cubic meter produced

### Purity Guaranteed

- Continuous online monitoring and automatic regulation
- Off-spec nitrogen is automatically vented to maintain product quality

### Monitoring and Control Systems

- Smart PLC control system
- Optional intelligent monitoring supporting remote communication
- One-click start/stop operation
- Automatic standby mode when nitrogen demand is low





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