



## POLYBED™ PSA SYSTEMS FOR GAS EXTRACTION AND PURIFICATION

The Pressure Swing Adsorption (PSA) process is based on the principle that adsorbents are capable of selectively adsorbing impurities. The impurities are adsorbed in a fixed-bed adsorber at high pressure and desorbed by “swinging” the adsorber from the feed to the tail gas pressure and by using a high-purity purge. Typically the desired component is not adsorbed and is recovered at high purity.

### *UOP's Polybed PSA system offers:*

- High reliability (greater than 99.8% on-stream time)
- Minimal manpower requirements due to automatic operation, which can include automatic start-up, capacity control, tail gas control, switchover, pressure control, and product purity control
- Reduced equipment costs and enhanced performance based on high performance adsorbents and advanced PSA cycles
- Lower operating and equipment costs for downstream process units due to the availability of a high-purity product gas
- Flexibility to process more than one feedstock and maintain product purity and recovery during changing conditions
- Minimal feed pretreatment and utility requirements
- Adsorbents last for the life of the mechanical equipment (more than 30 years)
- Reduced plot requirements, fast delivery times, and low installation costs based on the modular design
- Worldwide service and support



### OPERATION

UOP's Polybed PSA systems are designed to be safe, efficient, and economical.

A PSA system operates as a batch process; however, multiple adsorbers operating in a staggered sequence are used to produce constant feed, product, and tail gas flows. Regardless of the number of adsorber vessels, all Polybed systems follow the five-step pressure-swing cycle shown next. The brown area represents the impurities, and the blue area the product.

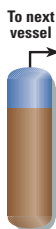
## STEP 1 ADSORPTION

The feed gas enters an adsorber at a high pressure, impurities are adsorbed, and high-purity product is produced. Flow is normally in the upwardly direction. When an adsorber has reached its adsorption capacity, it is taken off-line, and the feed automatically switched to a fresh adsorber.



## STEP 2 CO-CURRENT DEPRESSURIZATION

To recover the product trapped in the adsorbent void spaces, the adsorber is co-currently (in the direction of feed flow) depressurized. The product gas withdrawn is used internally to repressurize and purge other adsorbers.



## STEP 3 COUNTER-CURRENT DEPRESSURIZATION

At the conclusion of the co-current depressurization step, the adsorbent is partially regenerated by counter-currently depressurizing the adsorber to the tail gas pressure, and thereby rejecting the impurities.



## STEP 4 PURGE

The adsorbent is purged with a high-purity stream (taken from another adsorber on the co-current depressurization step) at a constant pressure to further regenerate the bed.



## STEP 5 REPRESSURIZATION

The repressurization gas is provided from the co-current depressurization step and a slip-stream from the product. When the adsorber has reached the adsorption pressure, the cycle has been completed, and the vessel is ready for the next adsorption step.



## COMMERCIAL EXPERIENCE

Since commercialization in 1966, UOP has provided over 700 PSA systems in more than 60 countries. These systems have found application in the refining, petrochemical, polymer, steel, and power generation industries. The Polybed PSA system has demonstrated exceptional economic value in many applications, such as recovery of hydrogen from refinery off-gases, recovery of monomers in polyolefin plants, extraction of hydrogen from gasification syngas, purification of helium for industrial gas use, adjustment of synthesis gas for ammonia production, purification of methane for petrochemicals production, and H<sub>2</sub>/CO ratio adjustment for syngas used in the manufacture of oxo-alcohols.

Feed conditions typically range from (7 to 70 kg/cm<sup>2</sup>g) (100 to 1,000 psig), with concentrations of the desired component from 30 to 98+ mol %. System capacities range from less than 1 to more than 350 MM SCFD (less than 1,100 to more than 390,000 Nm<sup>3</sup>/h).

### UOP:

- Optimizes the integration of PSA technology within your plant
- Continually improves existing technology to meet your changing process needs
- Develops new applications to meet your new challenges
- Provides ongoing technical services and support after startup.
- Keeps you informed on the latest developments and advancements in our technology through seminars and conferences
- Provides revamp services

## FOR MORE INFORMATION

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