

# Business Models in Respiratory Care

In many low- and middle-income countries (LMICs), hundreds of thousands of people, including many newborns, children, and pregnant women, die needlessly each year from a dangerous condition called hypoxemia, or a low concentration of oxygen in the blood. Hypoxemia can be caused by a range of illnesses and complications—including pneumonia, neonatal infections, premature birth, obstetric emergencies, and respiratory infections like COVID-19.

Despite the critical role that medical oxygen plays in treating hypoxemia across numerous disease areas, many facilities in LMICs still lack access to this lifesaving treatment. This situation is often attributed to the cost of oxygen and related infrastructure; in reality, oxygen access barriers are complex and rarely linked to a single factor.

Understanding the prevailing business models for oxygen production, storage, distribution, and delivery can provide important context as to how and why oxygen provision is limited in many countries. Scaling up oxygen globally will require significant shifts in many of the current business models prevalent in LMICs.

COVID-19 has cast a spotlight on oxygen, a health area that has long been neglected by the global community. With this attention, it is critical that decision-makers

and implementers understand the complexities of the oxygen ecosystem, the various business models that comprise it, and how they impact patient access.

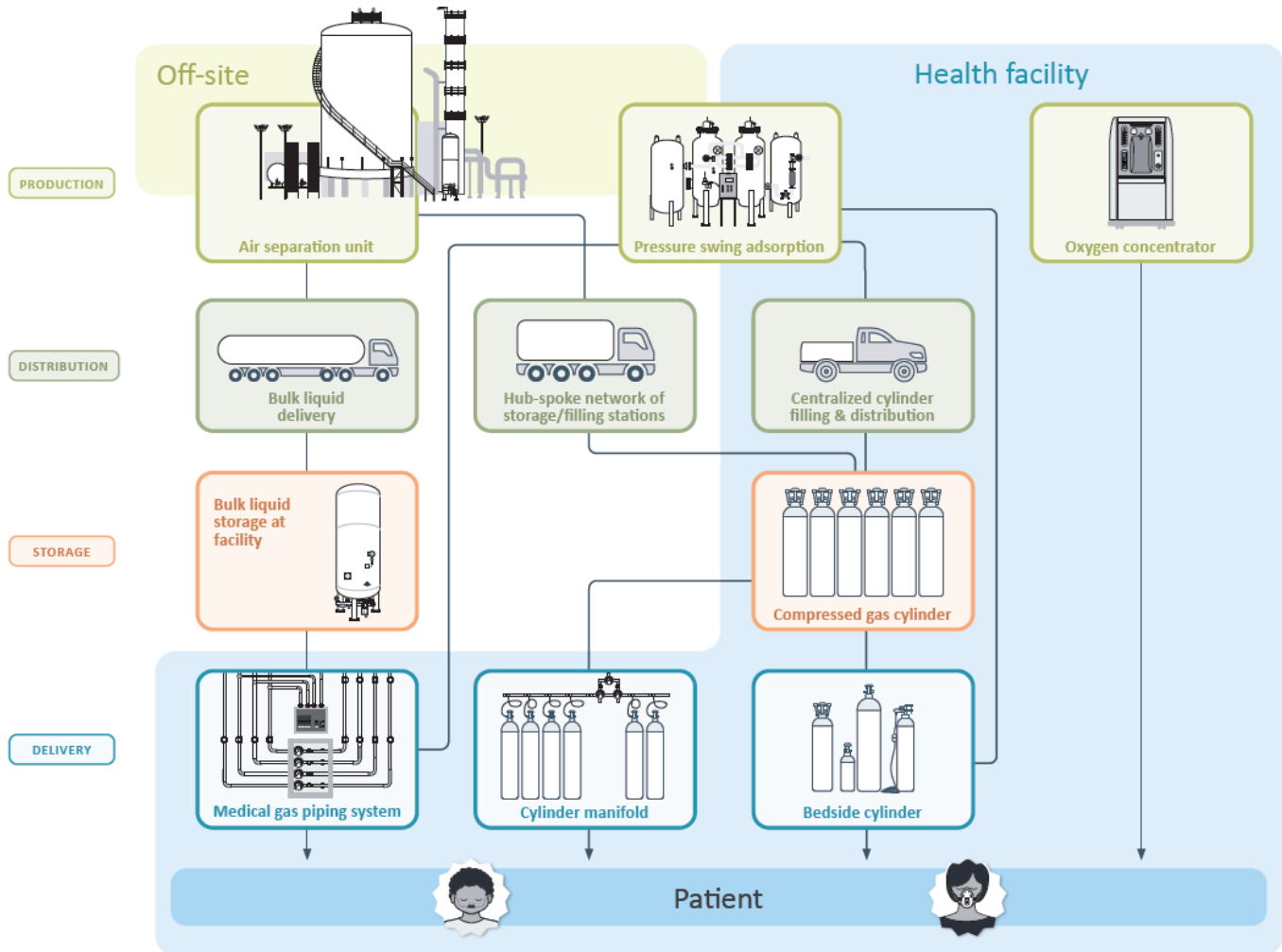
This brief introduces the oxygen ecosystem that business models operate within and then outlines four types of business models, divided into the following sections:

- **Bulk supply agreements** including liquid oxygen and gas cylinders.
- **Cash-and-carry filling stations** including liquid oxygen and pressure swing adsorption (PSA) plants.
- **Direct equipment purchases** including PSA plants and oxygen concentrators.
- **Equipment leasing** including liquid oxygen and PSA plants.

Facilitating scale-up of oxygen in LMICs depends upon a thorough and common understanding of various business models and their respective tradeoffs. By evaluating these models, the global community can better understand their potential benefits and shortcomings, improve informed decision-making on oxygen procurement and delivery, and move toward improving these approaches to increase access to medical oxygen.

# Oxygen ecosystem

Figure 1 (below) highlights pathways from oxygen production to distribution, storage, and delivery to the patient.



There are three primary ways oxygen is produced in LMICs: (1) through [air separation units \(ASUs\)](#), which produce liquid oxygen through cryogenic distillation in large quantities for commercial and medical purposes, (2) [PSA plants](#), which can be operated either from a central filling hub or at a facility, and (3) [oxygen concentrators](#), which are used directly in facilities for individual patients.

Once oxygen is produced by one of these three methods, it can travel many paths to reach patients via various distribution, storage, and delivery options. Oxygen produced by concentrators is the least complex method and is generally directly delivered to the patient

at the point of care. PSA plants can either be located at the facility and pipe oxygen directly to patients, or they can be located off-site and used to fill [gas cylinders](#) that can be distributed through facility networks. Lastly, liquid oxygen (LOX) produced by ASUs can be trucked to facilities and directly piped as gas to patients if a facility is equipped with the proper infrastructure. Alternatively, LOX from an ASU can be converted into gas and distributed via cylinders much like the PSA model. Because PSAs and LOX can both be used to supply piping systems and fill cylinders, there is considerable overlap between production modalities and business models.

# Bulk supply agreements

## Overview

In a bulk supply agreement, the vendor supplies oxygen to a facility and handles all aspects of the supply chain. The oxygen supplied can be LOX or gas cylinders delivered directly to a facility. In both cases, these agreements are often characterized by long-term contracts with defined ordering and payment terms as well as specified minimum volumes. Bulk supply agreements therefore typically include a large-volume buyer, such as a hospital, with consistent demand.

This type of oxygen delivery approach is not generally labor- or logistics-intensive from a buyer's perspective, as all costs and transportation are typically included within the supply agreement. However, bulk supply agreements do require supporting infrastructure, such as liquid oxygen tanks and/or piping with cylinder manifolds, and are best fit for large, high-demand facilities. In many cases, however, individual health facilities are left to independently plan and set up their own oxygen supply agreements with producers, which may make it more challenging to secure bulk oxygen supply at a competitive price for their individual demand. Central supply agreements—whereby national or subnational governments negotiate agreements for multiple facilities—are one mechanism to ensure sufficient supply, which is cost-effective and efficiently managed. However, health facilities in LMICs often lack predictable and sufficient volumes necessary to secure favorable pricing terms from gas companies, which reduces the cost-effectiveness of this business model. For both LOX and gas cylinders, a lack of credit and/or payment delays can result in disruption of oxygen supply.

## Liquid oxygen

One option for a bulk supply agreement is LOX, which is produced through an ASU and then transported to and stored in bulk tanks at a health facility. The LOX is vaporized on-site and distributed through piped systems in the facility to deliver the oxygen to the patient. Once stored in bulk tanks, liquid oxygen requires minimal power supply, making it an attractive option for many LMICs. However, bulk tanks at facilities must be refilled regularly to ensure a continuous supply of oxygen, especially in considering lost gas over time.

Because cryogenic fractional distillation is a less energy-intensive method of producing high-purity oxygen than other means, ASUs can achieve low unit costs for oxygen. In addition, transporting liquid oxygen is highly efficient as one liter of liquid oxygen converts into 798 liters of oxygen gas at a standard temperature and pressure. Bulk LOX supply can, therefore, be highly cost-effective where existing supply chains are able to reach high-volume facilities. Analysis of bulk liquid oxygen pricing in ten LMICs conducted by the Clinton Health Access Initiative (CHAI) and PATH found that this approach can deliver oxygen in bulk at prices below US\$5.50 per 6.8 m<sup>3</sup> (equivalent to one J cylinder).

An important consideration is that the primary use case for LOX is in nonmedical industries, such as metal fabrication. This can have significant

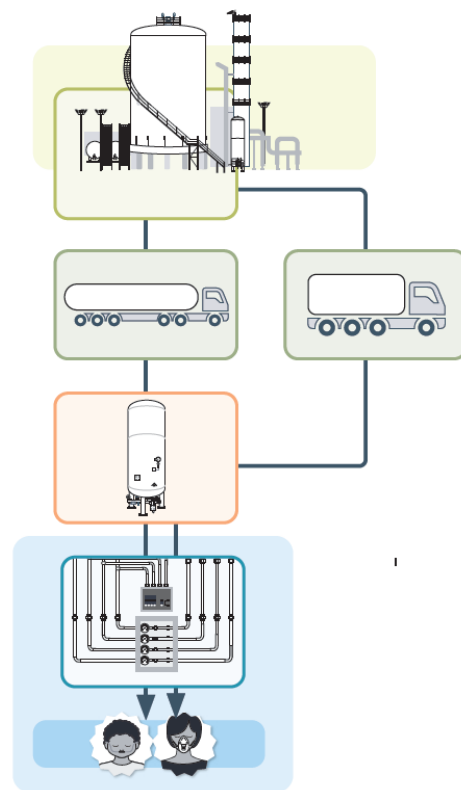


Figure 2 (above) highlights the oxygen pathway for liquid oxygen under bulk supply agreements—from production at ASUs through to delivery to the patient.

implications as to where LOX can be cost-effectively deployed as establishing new, high-capacity ASUs generally requires large upfront capital outlays. Moreover, countries vary significantly in terms of oxygen policy, hypoxemia diagnostic capacity, potential for demand aggregation, and oxygen delivery infrastructure. The maturity of these components will inform whether a country is well-suited for this model.

In order to use LOX, a facility must have space to safely accommodate a bulk storage tank and a comprehensive piping system to deliver oxygen to patients’ bedsides.

*Table 1. Key considerations for liquid oxygen bulk supply agreements.*

<b>Sales/procurement</b>	This approach primarily consists of long-term contracts with producers to supply liquid oxygen, which often include maintenance, transportation, and capital expenditure (e.g., tank installation) costs.
<b>Equipment ownership</b>	All equipment is usually owned by the supplier. Tanks may be owned by the health facility and managed by the supplier or leased to the facility by the supplier.
<b>Maintenance</b>	The supplier is 100 percent responsible for point-of-storage tanks and may also be responsible for vaporizers, manifolds, piping, etc.
<b>Payment terms</b>	The payment terms are usually by volume on delivery under negotiated/pre-agreed rates and terms. Access to credit can be a challenge, which may result in shortages.
<b>Distribution</b>	Liquid oxygen is trucked in by tankers that decant it into a tank at the health facility.
<b>Delivery to patients</b>	The oxygen is typically piped to the point of care, and the health facilities (often managed by the government) are responsible for consumables.

## Advantages

- Ability to reach rural areas.
- Concentrated, transportable product.
- Improved availability, since health facilities typically have large storage capacity.
- Economies of scale provide low unit costs.
- Minimal power requirements at the facility.
- Suitable for network supply agreements.
- Oxygen is delivered to point of use.

## Disadvantages

- Heavily reliant on nonmedical industry.
- Often dependent on health facilities with piping systems.
- Health facilities are sometimes reluctant to sign long-term contracts that could reduce the price.
- Power issues at ASUs can lead to supply interruptions.

## Liquid oxygen industry examples for bulk supply agreements

### Kenya

Kajiado County in southern Kenya signed a gas supply agreement with a private company covering more than 100 health facilities via five supply hubs—bulk liquid tanks placed at referral facilities. Orders are placed centrally through the county, and the company delivers bulk liquid to the referral facilities. Cylinders for smaller, peripheral facilities are filled and distributed from referral facility tanks, whereby the county pays the distribution charge. Cylinder deposits and rental fees normally charged to individual facilities are waived under a guarantee from the county government. This agreement led to a more than 70 percent reduction in delivered gas cost for county facilities and a doubling of county oxygen coverage between 2018 and 2019. The guarantees that cover many of the individual facilities likely contribute to these reduced costs.

## Liquid oxygen industry examples for bulk supply agreements (cont.)

### Malawi

A common misconception is that it is not cost-effective to transport liquid oxygen long distances. However, Malawi has no domestic ASUs or liquid oxygen production. Through a bulk supply agreement, a commercial producer in South Africa transports LOX from Pretoria to Blantyre, Malawi, which is about 1,700 kilometers away. The LOX primarily serves industrial customers, but a small quantity is used for medical purposes. In the case of Malawi, LOX is transported thousands of kilometers because there is sufficient demand—especially taking advantage of the industrial demand to also bring in oxygen for medical purposes.

## Gas cylinders

Bulk supply agreements are not exclusive to liquid oxygen. It is common in developed oxygen markets to have broad network supply agreements that include both LOX and [gas cylinder](#) supplies from the same supplier to different levels of health care within the network. Oxygen is either converted to gas from liquid or is generated by a high-capacity [PSA plant](#) and compressed into cylinders. This process can happen at a referral facility or at a central filling station. The cylinders are transported to health facilities with no or limited on-site oxygen production.

The supplier is responsible for providing oxygen to all facilities in scope by managing the filling and routine distribution of cylinders (either directly or through a third-party logistics company). Such agreements are common in high-income countries and a handful of middle-income countries. While this model can offer a streamlined approach to oxygen delivery in many LMICs, its success depends on the geographic distribution of the facilities in scope, as well as the supplier's footprint and ability to expand and/or optimize its distribution network to reach lower-volume facilities.

The primary advantage of gas cylinders is their flexibility—as they can be deployed to the point of use, in which case facilities do not require specialized infrastructure for delivery. They can also be used together with a manifold system, enabling gas to flow from the cylinder through facility piping to the patient's bedside. The primary disadvantage is that managing stock and distribution of cylinders can be complex and costly. For example, while this model can enable expanded oxygen access at lower-level health facilities, additional capital costs (e.g., for cylinder stocks) and ongoing transportation costs can increase the overall cost of oxygen delivered via cylinder by approximately 57 to 75 percent, according to an internal analysis. However, costs per cylinder delivered of less than US\$10.00 can be achieved within a reasonable catchment area in optimized systems. In addition, cylinder shortages can occur during times of high demand, which has happened during the COVID-19 pandemic.

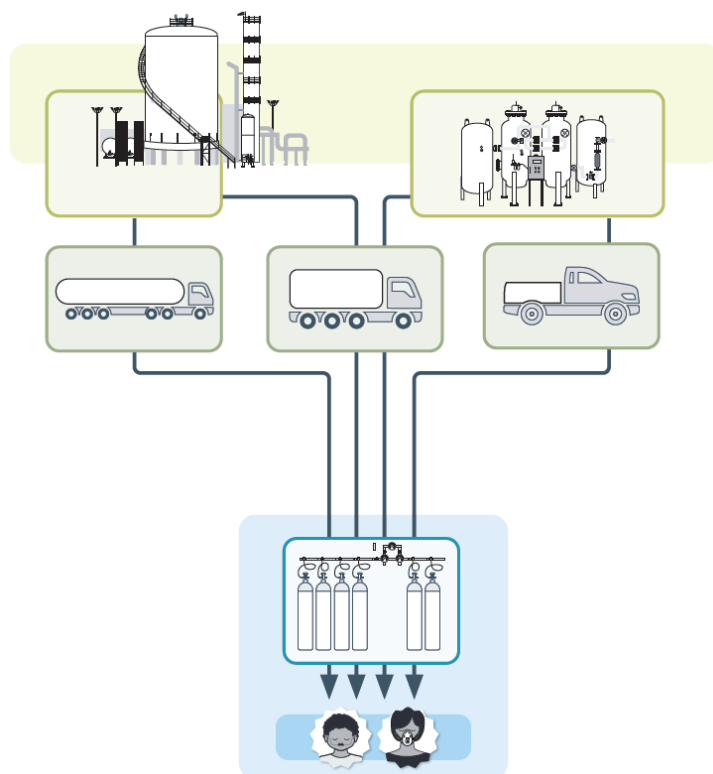


Figure 3 (above) highlights the oxygen pathways for gas cylinders under bulk supply agreements—from production at ASUs or PSA plants through to delivery to the patient.

Table 2. Key considerations for gas cylinder bulk supply agreements.

<b>Sales/procurement</b>	This approach usually consists of long-term supply contracts with defined volumes and payment terms for either individual facilities or facility networks.
<b>Equipment ownership</b>	Production equipment is usually owned by the gas supplier, and the storage equipment is usually owned by the supplier and/or leased to the buyer.
<b>Maintenance</b>	The gas supplier is responsible for production and storage equipment maintenance and may or may not be responsible for the oxygen manifold or piping.
<b>Payment terms</b>	The payment terms are usually by volume on delivery under negotiated/pre-agreed rates and terms. Access to credit can be a challenge, which may result in shortages.
<b>Distribution</b>	The oxygen is trucked in high-pressure cylinders, by which the supplier is responsible for delivery on order.
<b>Delivery to patients</b>	The cylinders can be connected to piping through a manifold and/or carted to the point of care. Health facilities (often managed by the government) are responsible for consumables.

## Advantages

- Piping is not required at the facility (but still recommended).
- Oxygen is delivered to the point of use.
- Suitable for lower-volume facilities not fit for bulk liquid supply.
- No electricity is required at the facility.

## Disadvantages

- Cylinder transport and logistics can be complicated and costly.
- Cylinder stock management at the facility can be burdensome.
- Cylinder rental and deposit fees can be costly (but can be negotiated down/waived).

## Gas cylinders industry examples for bulk supply agreements

### Kenya

A Kenyan social enterprise installed a pressure swing adsorption (PSA) plant co-located at a referral facility in Siaya County in western Kenya. The plant serves the facility where it is located via direct piping and cylinders. Oxygen via cylinders is also sold and distributed to neighboring health facilities according to a tiered pricing scheme. In this case, a health facility acts as the “hub” in a hub-and-spoke model. It can receive oxygen directly via PSA, which can also be used to fill cylinders for surrounding facilities.

### Ethiopia

A private company manages a 260 m<sup>3</sup>/hour plant in Addis Ababa, Ethiopia, which is able to fill up to 1,000 cylinders a day. The standard rate per cubic meter of oxygen is ETB20, with discounts up to 30 percent for large-volume customers via sales agreements. The company also leases cylinders as a part of some supply agreements and offers cylinder transport for large-volume customers within reasonable distance to the facility (primarily in and around Addis). Purchasing large volumes of oxygen in these situations can result in significant discounts to the buyer, but consistency is important to maintain this arrangement.

# Cash-and-carry filling stations

## Overview

Cash-and-carry filling stations typically involve a private merchant filling oxygen cylinders that customers bring to a central depot. Refills are completed on an as-needed basis and customers are typically responsible for transportation. Cash-and-carry filling stations are the default choice when there are no other options present or if oxygen is needed on demand and inconsistently.

## Liquid oxygen and PSA

Cylinders can be filled at liquid-to-gas filling stations supplied via liquid oxygen production sites (e.g., ASUs) to take advantage of transport efficiencies for bulk liquid oxygen to reduce the cost of oxygen at the point of sale. These filling stations effectively serve as supply “hubs” for catchment areas far from bulk production sites but must be regularly re-supplied via tanker—and therefore rely on good-quality transport connections to maintain cost-effectiveness and avoid supply disruptions.

Cylinders can also be filled at PSA plants equipped with booster compressors. With this approach, there is no upstream supply chain required to maintain oxygen supply, which may be useful for serving facility clusters in areas with poor transport connections. However, full operational and electrical requirements at the point of production/filling may create an access barrier for this model.

Cash-and-carry services are relatively labor- and logistics-intensive for the buyer, as the customer is responsible for cylinder transportation, and must either provide the cylinders themselves or incur substantial rental and deposit fees when using the supplier’s cylinders. Price and availability can fluctuate depending upon demand. Typically, these suppliers are managed by single-location merchants and not franchises. Merchants may lease PSA equipment or have a bulk supply agreement with a larger supplier. Large suppliers offering bulk supply agreements also generally offer cash-and-carry services at significantly less favorable rates, with substantially fewer after-sales services and more stringent restrictions on the use of customer-owned cylinders. Advantages to this approach include minimal upfront costs for facilities—especially as a “supply of last resort” if other oxygen sources fail or are overwhelmed by demand. Disadvantages include higher prices, possible stockouts, and expensive, potentially challenging, transportation logistics.

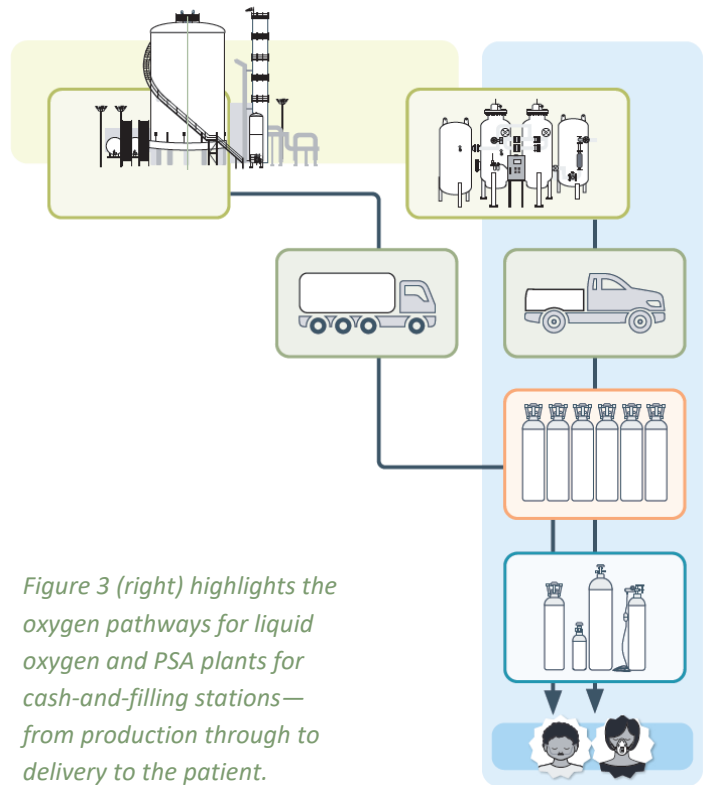


Figure 3 (right) highlights the oxygen pathways for liquid oxygen and PSA plants for cash-and-carry filling stations—from production through to delivery to the patient.

Table 3. Key considerations for liquid oxygen and PSA cash-and-carry filling stations.

<b>Sales/procurement</b>	Facilities pick up cylinders from a filling station and pay on pickup. Sometimes, they may be able to order ahead.
<b>Equipment ownership</b>	Cylinders are owned by the supplier and rented to facilities or facilities may own their own cylinders.
<b>Maintenance</b>	Suppliers maintain production, filling equipment, and cylinders (when rented), and facilities are responsible for manifolds, piping, etc. when these are used.
<b>Payment terms</b>	Payment occurs on pickup according to the supplier price list at the time of supply.
<b>Distribution</b>	The facility is responsible for cylinder transport, which may include hiring a third party as needed.
<b>Delivery to patients</b>	Cylinders are placed directly at the point of care or connected to a manifold and piping and then delivered to the point of care. Health facilities (often managed by the government) are responsible for consumables.

### Advantages

- No electricity is required at the facility.
- When properly managed, can be responsive to short-term needs.
- Piping is not required at the facility.
- Lowest upfront/capital expenditure costs for facilities.

### Disadvantages

- Poor pricing and higher transport costs due to the one-off nature of purchasing leads to expensive unit costs over the long term.
- Cylinder transport can be expensive and complicated.
- Ad-hoc supply often results in oxygen stockouts in specific wards or facility-wide.

## Liquid oxygen and PSA industry examples for cash-and-carry filling stations

### Indonesia

Many small-scale oxygen cylinder filling enterprises exist within the private sector in Indonesia. Health facilities bring cylinders to merchants that purge and refill the cylinder from another larger gas oxygen cylinder or a liquid oxygen tank. Refills are completed on an as-needed basis, and the spot market and prices are often based on cylinder size.

### Ethiopia

A private company manages a 260 m<sup>3</sup>/hour plant in Addis Ababa, Ethiopia, which is able to fill up to 1,000 cylinders a day. The standard rate per 6.8 m<sup>3</sup> of oxygen (equivalent to one J cylinder) is ETB136 (approximately US\$2.90). The company also sells cylinders and related equipment for ETB4,700. Customers arrange their own transport, especially if they are coming from outside of Addis, refill their own cylinders, and pay when filling.



# Direct equipment purchases for on-site generation

## Overview

Health facilities and health administrative units—such as ministries of health, health development agencies, and medical supplies agencies—often choose to purchase equipment to produce oxygen on-site via [PSA technology](#) or [oxygen concentrators](#). Equipment is purchased outright and is generally installed by the vendor supplying the equipment—though the ongoing maintenance and operation of the equipment is the buyer's responsibility to arrange. On-site oxygen generation is often pursued for health facilities that lack access to affordable bulk supply agreements, are remote or isolated, and/or need moderate to small oxygen volumes. On-site generation can be cost-competitive with bulk supply agreements in many settings. However, their ongoing maintenance needs require either qualified staff at the health facility or a separate maintenance contract with a qualified vendor. Equipment that does not receive regular maintenance quickly breaks down. Moreover, equipment for on-site oxygen generation requires constant, stable electricity—and local electricity rates have a major impact on the cost-effectiveness of on-site generation equipment. For example, electricity costs represent approximately 50 percent of annual PSA plant operating costs and can be equivalent to as much as one-third of the initial capital cost for a new plant, according to an internal analysis. These ongoing costs are substantial and can exceed the original capital cost of the plant within just a few years.

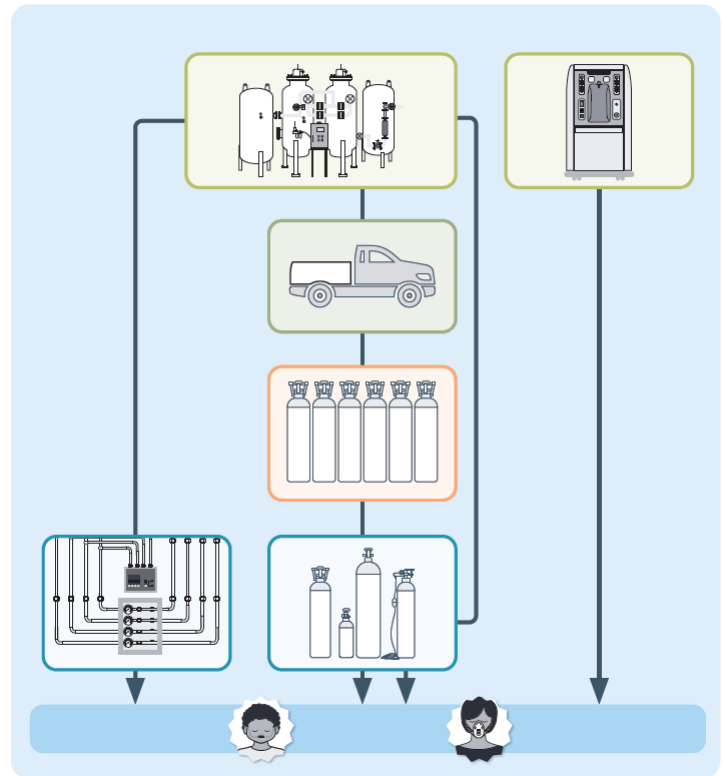


Figure 5 (above) highlights the oxygen pathways for PSA plants and oxygen concentrators under direct equipment purchases—from production through to delivery to the patient.

## PSAs and oxygen concentrators

Direct purchase of PSA plants is appropriate when large-scale on-site production is necessary and should be sized appropriately to demand. This model requires careful planning to be deployed effectively—it requires either piping within the facility or a booster compressor for cylinder filling to be added to equipment configuration. In addition, the high upfront cost of the equipment can be a major barrier to purchasing. Lastly, operating costs, including electricity, human resources, and supplemental parts, are essential to include when planning a budget. Without considering these essential issues, oxygen production could be limited, which would render the equipment investment much less cost-effective than anticipated and may result in supply disruptions.

Direct purchase of oxygen concentrators is appropriate for small-scale production at the point of care, though most models only have low output pressure (i.e., no high-flow or positive end-expiratory pressure). This model is often seen as a good fit for smaller facilities with more basic oxygen needs, though power and maintenance requirements can limit their effective deployment in practice. Concentrators are often seen as more flexible and quicker to deploy than large equipment, e.g., PSA plants or bulk tanks, but large quantities of concentrators create substantial maintenance and asset-management burdens that similarly constrain their rapid deployment.

*Table 4. Key considerations for direct equipment purchase of PSA plants and oxygen concentrators.*

<b>Sales/procurement</b>	The equipment is purchased via tenders from distributors, wholesalers, or manufacturers. Smaller lots may be purchased without tender.
<b>Equipment ownership</b>	Facilities (or the government that manages them) own the equipment.
<b>Maintenance</b>	Facilities (or the government that manages them) are responsible for maintenance. The supplier installs the equipment, which can be managed in-house or outsourced via contract. A warranty with the supplier may cover some level of regular (e.g., annual) maintenance but may not be comprehensive.
<b>Payment terms</b>	The payment terms are defined in the tender process and/or informed by the supplier bid. Half of the payment or more is often due upfront with the remainder due on delivery. If a maintenance contract is included in the tender, the first payment on the maintenance contract is generally completed on delivery.
<b>Distribution</b>	Oxygen is produced on-site. The supplier is responsible for the transport of the equipment to the installation site.
<b>Delivery to patients</b>	For concentrators, oxygen is produced at the point of care. For PSAs, oxygen is produced on-site and piped to the point of care or used to fill cylinders. Health facilities (often managed by the government) are responsible for consumables.

## Advantages

- No travel or transport involved.
- Dedicated supply for specific/individual facilities.
- Low operating/ongoing costs achievable depending on electricity and maintenance costs.
- Long life span if properly serviced and maintained.

## Disadvantages

- Products often fall into disrepair due to a lack of regular maintenance.
- PSA specifications must be adapted to the environmental conditions of individual facilities.
- Adequate sizing can be difficult without more complex analysis (however, this can be addressed in the tender process).
- High upfront capital expenditure required.
- Requires reliable electricity at the host facility.

## PSA and oxygen concentrator industry examples for direct equipment purchasing

### India

The Government of India, under the Prime Minister's Citizen Assistance and Relief in Emergency Situation (PM-CARES) Fund, has sanctioned the procurement of 1,213 PSA plants to be set up in public health facilities across the country. Of these, 500 PSA plants will be established with transfer of the indigenous technology developed by the Defense Research and Development Organization and the Council of Scientific and Industrial Research to the domestic manufacturers. The average cost is approximately US\$120,000 for a 600 liters per minute model. The government is also looking to purchase annual maintenance contracts for each plant.

### Ethiopia

In Ethiopia, the Federal Ministry of Health and Regional Health Bureaus procured and installed more than 3,000 oxygen concentrators in 2017 to supply oxygen in pediatric wards across the country. The Ethiopian Pharmaceuticals Supply Agency subsequently added concentrators to the national drug revolving fund—allowing facilities to purchase concentrators as needed.

## Equipment leasing

### Overview

Equipment leasing is a common model for procuring medical equipment that is too expensive to directly purchase, which means there are various forms that can be pursued—including bespoke offerings in response to tenders. It often involves a third-party financier who provides the capital and makes a profit on the income from the lease payments. Equipment leasing can be used by individual facilities and is often used by gas merchants. This model is uncommon in low-income markets, though subscription models that rely on grant funding for startup are somewhat similar. This approach is beneficial if the buyer lacks a large capital base but is a reliable payer—as it spreads the costs over time and bundles maintenance services—and if suppliers are able to mobilize capital and have technical capacity. It allows for predictable, regular costs regardless of demand fluctuations. While this model is often facilitated in other sectors (e.g., agriculture), it has the potential to be an option to vendors or purchasers for oxygen in LMICs, especially when pursuing bespoke offerings.

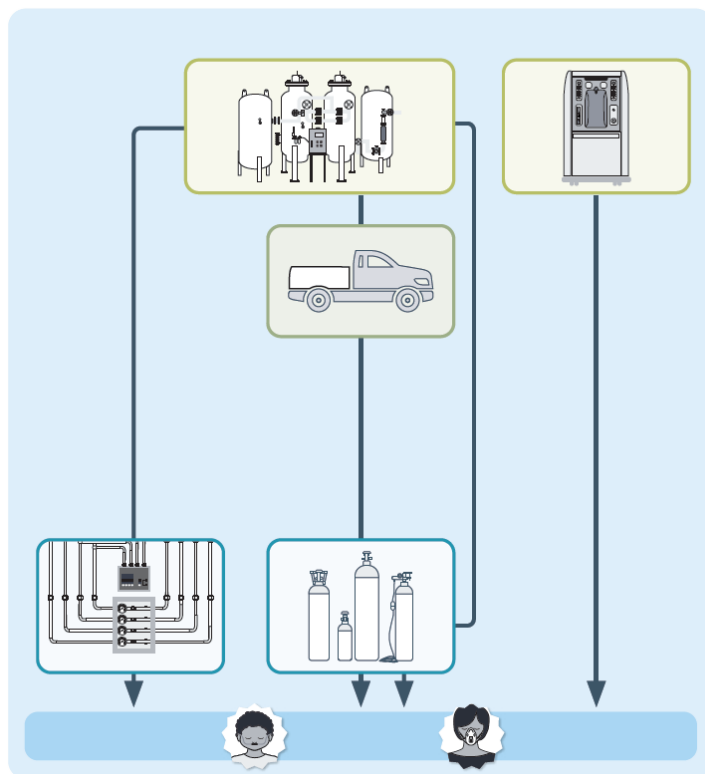


Figure 6 (above) highlights the oxygen pathways for PSA plants and oxygen concentrators under equipment leasing—from production through to delivery to the patient.

## PSA and oxygen concentrators

Equipment leasing for PSA plants requires a well-capitalized vendor given the high upfront costs, especially for larger models. Access to concessional financing can allow smaller companies to offer new or expanded leasing options and has been used to expand leasing in LMIC markets for agricultural and other equipment. Depending on the contract terms, leases for PSA plants can effectively remove the burden on facilities for technical staff, maintenance services, parts sourcing/supply, and electricity provision—though these costs need to be reflected in the lease payments to ensure viability.

Equipment leasing for concentrators can theoretically be done by smaller companies given lower unit costs, though providing maintenance services requires companies to have specialized capabilities uncommon among smaller enterprises. Because concentrators are more likely to be deployed at smaller, more remote facilities, they are likely to be higher cost than PSA leasing, as the vendor takes on the burden of distributed maintenance and asset management (see country example in Senegal).

*Table 5. Key considerations for equipment leasing of PSA plants and oxygen concentrators.*

<b>Sales/procurement</b>	Leases are primarily done via tender for large lots and/or high-value equipment or through standard offerings for small lots and/or low-value equipment. The procurement of the equipment is typically termed, after which it is returned or purchased in full.
<b>Equipment ownership</b>	The supplier or third-party financier owns the equipment.
<b>Maintenance</b>	The supplier is responsible for preventative maintenance, and facilities may still be responsible for routine maintenance.
<b>Payment terms</b>	The payment terms generally include a defined schedule (usually monthly or quarterly or possibly up to annually) per the lease agreement. Payments are made to the supplier or third-party financier.
<b>Distribution</b>	The oxygen is produced on-site. The supplier is responsible for the transport of the equipment to the installation site.
<b>Delivery to patients</b>	For concentrators, oxygen is produced at the point of care. For PSAs, oxygen is produced on-site and piped to the point of care or used to fill cylinders. Health facilities (often managed by the government) are responsible for consumables.

### Advantages

- Swaps high upfront capital acquisition costs on the buyer side for predictable payment schedules independent of the volume of oxygen used.
- Maintenance service provided by supplier under terms of the lease.
- Often includes a low-cost buyout option at the end of the lease.

### Disadvantages

- Perceived risk of nonpayment from facilities/government may result in unfavorable lease terms.
- Late payments or defaulting on lease terms may result in the removal of equipment.
- Requires supplier with large, diversified capital base and/or access to affordable capital financing.
- Requires reliable electricity at the point of care.

## PSA and oxygen concentrators industry examples for equipment leasing

### Kenya

The Ministry of Health in Kenya contracted numerous pieces of medical equipment, including an equipment lot for intensive care units that included a smaller PSA oxygen plant. Lots were leased for a seven-year period and included acquisition, installation/calibration, and ongoing preventative and corrective maintenance of the oxygen equipment.

### Senegal

Under an oxygen access program in Senegal, facilities rent kits with one oxygen concentrator, one pulse oximeter, and one 10-liter cylinder at a maximum of €160/month/kit. This effort is a social impact initiative targeting low-income markets with an estimated breakeven point of approximately 20 kits per hub.

## Conclusion

Scaling up oxygen globally will require a shift in thinking to better consider the different business models for respiratory care. Many LMICs are limited in what business models are available to pursue in increasing access to medical oxygen—which makes it challenging for them to scale up the best fit-for-purpose option. Moving forward, efforts should be made to expand and diversify the available business models so that countries, or health facilities within countries, can access the model or models that work best for their context and setting. Critical areas that require further thinking and investment are (1) strengthening or expanding health system infrastructure for medical oxygen, such as piping, distribution networks, bulk tanks/manifolds, etc.; (2) increasing availability to long-term partnership and agreement options between health systems and vendors through service contracting, equipment leasing, etc. in order to reduce the necessity for direct, one-time equipment purchases; and (3) aggregating the demand for respiratory care equipment among multiple health facilities to improve their investment case, reduce risk, and streamline system-wide equipment management. By understanding these complexities, donors, country governments, and health facilities can invest and pursue strategies that will strengthen oxygen business models, lower health care costs, and improve health outcomes.

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## For more information

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Contact us at [oxygen@path.org](mailto:oxygen@path.org)