

Solar-powered oxygen concentrator

Country of origin		Canada
Primary function		Treatment
Category		Oxygen system

Commercial information

List price (USD):	\$10,000 ¹
Year of commercialization:	2020 ¹
Number of units distributed:	0-100 ¹
Currently marketed in:	Uganda, Somalia, DRC, Kenya ²
Brand:	DeVilbiss ³
Model:	525DS ³



Health problem addressed

Pneumonia is the leading cause of childhood mortality worldwide with over 900,000 deaths annually. Most of these deaths are concentrated in low-resource countries in Africa and Asia where reliable access to oxygen is limited. The WHO has added oxygen to its Model List of Essential Medicines, given its importance in treating pneumonia and other hypoxemic diseases such as COVID-19. Studies have demonstrated that reliable access to oxygen can reduce deaths due to pneumonia in children by up to 35%.¹

Product description

The technology is a solar-powered oxygen system to address limited access to oxygen in LMICs. These systems consist of a commercially available oxygen concentrator, connected through a charge controller to a battery bank and solar panels, producing medical grade oxygen without access to the power grid. The system can be designed to draw power from the grid when available and switch to solar/battery power during outages, or to draw solar/battery power only.¹

Product details

Accessories:	Pulse oximeter ¹
Consumables:	Filters/sieve beds ¹
Lifetime:	5-10 years ¹
Energy requirements:	Rechargeable battery, solar power (AC powered, voltage can be adapted, 400W, 72-hour battery life) ¹

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- ¹ Reported by manufacturer on 28 August 2020
² Reported by manufacturer on 8 December 2020
³ Reported by manufacturer on 18 January 2021

WHO ASSESSMENT

WHO specification comparison

The oxygen concentrator used in this oxygen system partially complies with the WHO technical specifications.

Compliant: The oxygen concentrator in the system is designed for the same intended use as other concentrators.

Some aspect that could not be verified: Some aspects that could not be verified such as power efficiency and EMC compliance for TUV 50 Hz and 1500-400 M at 230 V. The batteries proposed for the system are valve-regulated stationary lead-acid batteries. From a technical perspective, sealed gel or lithium batteries are preferred in an oxygen rich environment. This is a good concentrator; however, it is expensive and spare parts are not available everywhere as specified by the manufacturer.

Regulatory assessment

 Pre-market assessment	 Proceed with caution
 Post-market assessment	 Proceed with caution
 Quality system assessment	 Proceed with caution

Some requested information and documentation for all three Regulatory and Quality Assessment categories is absent. Therefore, a thorough review of this product was not possible at this time. At the time of report creation, DeVilbiss has obtained an EU MDD CE Mark and US FDA 510(k) clearance. The regulatory status for the various accessories is currently unclear. DeVilbiss has obtained an ISO 13485:2016 certificate. DeVilbiss concentrator with extra solar power system must also ensure they comply with local country import and pre-market regulations.

Technology evidence assessment

Domains	Evidence assessment		Innovation
	Risk/benefit ratio	Impact	
Medical			
Safety			
Economy			
Organizational			
Legal			
Social			
Ethical			
Green environment			

This solar powered oxygen system provides reliable and sustainable access to oxygen. Components are commercially available. The system and its associated components are tailored to the unique needs of a health facility. The solar charging speed and backup battery supply varies based on the panels and batteries used and the number of sunlight hours at a given location. Tests are being performed to evaluate the system's clinical benefit in treating pediatric pneumonia. Clinical training and supervision are provided to ensure effective implementation.

Summary

Transferability		Technology readiness level	8
Evidence (according to GRADE)		Technology evidence assessment	Recommended with caution

Health technology and engineering management

Domains	Appropriateness	Domains	Appropriateness
Durability		Ease of maintenance	
Ease of Use		Infrastructure requirements	
Positive impact on clinical outcomes		Local access to sales support	
Affordability		Local access to technical support	
Engineering resources minimization		Local access to training	
Cultural and social acceptability		Local access to spare parts	
Environmental conditions		Local production	
Aesthetics		Locations of use within target setting	
Ease of cleaning			

Target setting: Clinics and secondary hospitals

This product is intended for delivering oxygen therapy and managing hypoxia in young patients. The system consists of an oxygen concentrator powered by a solar energy system. The solar energy system stores excess energy collected during the daytime that can be used to operate the device at night or during power outages. The system delivers between 1-5 LPM of oxygen captured from the surrounding air, which is then subjected to filtration and sieve pads within the concentrator. As a result, the nitrogen is absorbed thereby increasing the concentration of the oxygen delivered via a cannula or face mask. The oxygen concentrators are two models manufactured by DeVilbiss Healthcare. There are 10 years of established post market data

for these models. The product is similar to other similar oxygen concentrator systems with the added advantage of being energized by solar power. The solar panels must be installed in an area with sun exposure and connected to the inside of the facility with electrical wires. Batteries must be installed within the facility to collect the excess power. There is significant installation and system costs of about \$10,000 USD per unit. Semi-annual maintenance by a technician is required in order to inspect and replace panel and battery parts and components within the concentrator.