

Haskel[®]
INTERNATIONAL, INC.

**SF₆ GAS RECOVERY
& RECLAIM SYSTEMS**
FOR THE POWER TRANSMISSION INDUSTRY



**OUR PRODUCTS ARE BACKED BY OUTSTANDING TECHNICAL SUPPORT, AN
EXCELLENT REPUTATION FOR RELIABILITY AND WORLDWIDE DISTRIBUTION**





Haskel[®]
INTERNATIONAL, INC.

Haskel International, Incorporated – Industrial Technologies Division, has nearly 60 years of experience in high-pressure gas and liquid engineering with the development of a wide range of air driven gas boosters and liquid pumps. Located in Burbank, California, U.S.A., with an additional manufacturing plant in the United Kingdom, Haskel International is supported by a worldwide network of offices and distributors.

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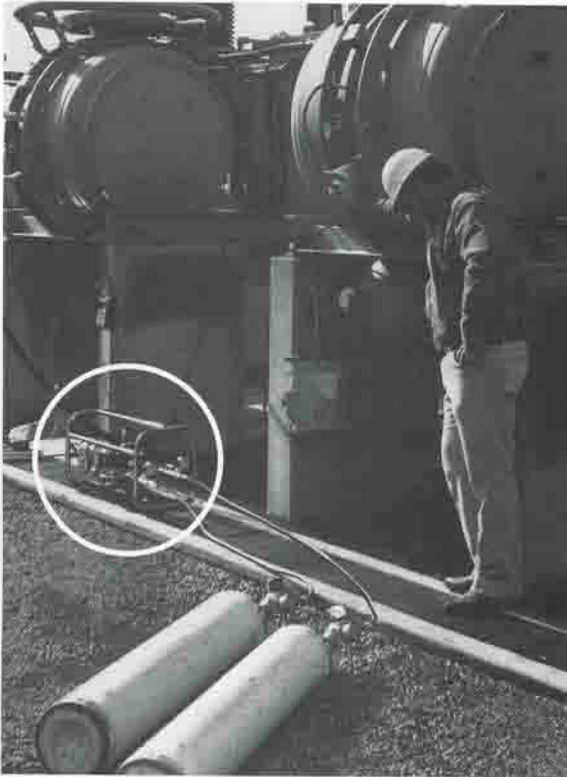
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High-Voltage Transformer

Haskel has developed a range of specialized mobile gas handling systems capable of handling sulphur hexafluoride (commonly known as SF₆ gas) in either a liquid or gaseous state. In conjunction with the National Grid Company PLC, formerly the Central Electricity Generating Board, in the United Kingdom, our engineers have designed these systems to meet the varied and growing needs of the world's power generation companies.

Haskel is able to assist with the specifications and customization of units to suit your requirements. Please contact any of our facilities around the world for further information (or request our SF₆ Cart Video).



Portable Transfer System – Model 52059

WHAT IS SF₆ GAS?

Sulfur hexafluoride is commonly known as SF₆ gas. Its unique properties and characteristics make it an excellent insulating gas and gaseous dielectric within the electric utility industry.

Commonly found in high-voltage power applications, SF₆ is used extensively in circuit breakers and other switchgear. It is also used in linear accelerators, high-voltage transformers, switches, capacitors and coaxial cables.

It is one of the most expensive of industrial gases and this, together with the ever-increasing environmental issues, has made the recycling of SF₆ a growing necessity.

Recycling SF₆ Gas

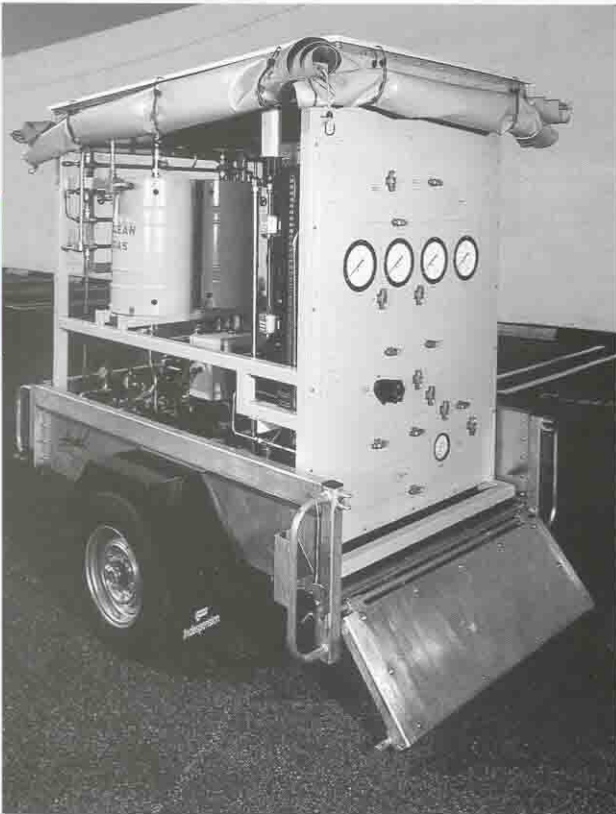
While SF₆ gas is not a Montreal Protocol Substance, it is very costly to simply waste the gas when it can be efficiently recovered, cleaned and returned to the equipment after maintenance work has been completed. Regardless of the situation and the state of the gas, both equipment and procedures exist for the complete recovery and purification of the gas to a position where it can be re-used as "new gas."

In the power generation industry, SF₆ is generally contained in the high-voltage equipment and unless subject to leaks, is prevented from spilling into the atmosphere. However, while under normal conditions there is no leakage of the gas, its performance may decline over time due to certain conditions causing contamination.

Such contamination may be the result of moisture and decomposition products. At high temperature, during electric arcing for example, SF₆ can slowly decompose. Such decomposure produces byproducts which will react with moisture to produce a variety of substances. These substances, together with decomposition byproducts, can be extremely corrosive and toxic.

Fortunately, if detected in time, such contamination in the gas can be easily removed utilizing Haskel Recovery and Reclaim units. This allows for the gas to be fully re-used after maintenance of the high-voltage equipment. It also allows for recovery and re-use of gas from equipment ending its service life, to be transferred to new or replacement equipment.

Irrespective of how much or how little gas is involved, Haskel believes no SF₆ gas should need venting to atmosphere, and offers equipment to suit any requirement.



Typical Mobile SF₆ Gas Handling Carts

MOBILE SF₆ GAS CARTS

Haskel SF₆ Gas Carts are designed to evacuate, recover, dry, filter, clean, store and recharge the purified SF₆ gas after maintenance work on high-voltage equipment.

Haskel offers a choice of five standard models, any of which can be modified or customized to suit customer

specifications. Units include a Haskel Gas Booster/Compressor, molecular sieve filters, storage tanks, condenser, after-cooler for liquifying gas, full mimic control panels with all necessary gauges, valves, pressure regulators and controls.

FEATURES

- **Oil free** – non-contaminating, booster/compressor can be operated dry — no lubrication necessary.
- **Economical** – unit handles SF₆ in liquid or gas state. No phase control needed. No heat generated during liquid phase.
- **Liquification** – two-stage positive displacement booster/compressor provides liquification without the need for a condenser.
- **Simple** – Mimic Control Panel means no special operator skills required for any operation. Fully mobile, go-anywhere cart.
- **Extra filtration** – molecular sieve filters remove toxic corrosive byproducts. Additional filtration provided by transforming from "Reclaim" to "Re-use" vessel in the liquid state.
- **Sampling** – gas sample points provided to measure dew-point, acidity and O₂ content.
- **Quality** – manufactured to ISO 9001 (BS 5750 pt. 1). Approved by National Grid PLC, United Kingdom.
- **Technical support** – worldwide technical support by Haskel subsidiaries and fully-trained distribution.
- **Safe** – Designed using Haskel's long and proven experience in handling gases at high pressure.
- **Fast pay-back** – capital costs rapidly repaid by total recycling of expensive gas.

SPECIFICATIONS OF STANDARD MODELS

MODEL	SF6-40	SF6-80	SF6-160	SF6-200	SF6-400
Type	Skid mounted with optional 2-wheel trailer	Mobile 2-wheel road-going trailer. Vinyl weatherproof awning.	Mobile 2-wheel road-going trailer. Vinyl weatherproof awning.	Mobile 2-wheel road-going trailer. Vinyl weatherproof awning.	Mobile 4-wheel road-going trailer. Fully enclosed with access hatch and operator shelter.
Pump Model*	AGD-4	AGD-4	AGD-4	AGD-4	8AGD-5
Storage Vessels	1 x 40L	2 x 40L	4 x 40L	1 x 200L	2 x 200L
Vessel Certification	BS5045B2	BS5045B2	BS5045B2	BS5045B2	BS5045B2
System Pressure	725 psig	725 psig	725 psig	725 psig	725 psig
Nominal Recovery Rate (liquid)	8 gpm	8 gpm	8 gpm	8 gpm	30 gpm
Nominal Recovery Rate (gas)**	3 scfm	3 scfm	3 scfm	14 scfm	14 scfm
Pump Displacement/Cycle	19.3 in ³	19.3 in ³	19.3 in ³	19.3 in ³	71.4 in ³
Vacuum Displacement	5.65 scfm	5.65 scfm	5.65 scfm	2.5 scfm	2.5 scfm
Vacuum Pressure	0.0295 in. HG	0.0295 in. HG	0.0295 in. HG	0.0295 in. HG	0.0295 in. HG
Power Requirement (Control Voltage 110 VAC)	-	-	-	440V 3ph 30A	440V 3ph 30A
Dimensions***	90" H x 100" L x 75" W	90" H x 120" L x 75" W	90" H x 150" L x 75" W	90" H x 120" L x 75" W	77" H x 119" L x 71" W Door - 73" H x 57" W
SF ₆ VAC Compressor to 1.5 in. HG†	-	-	-	3 scfm	3 scfm

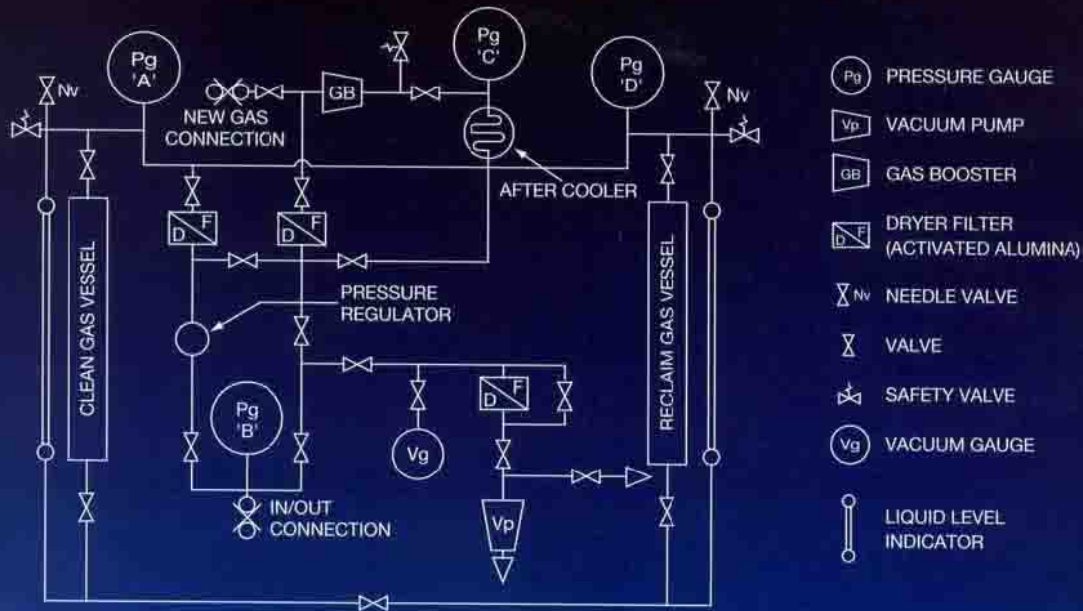
* Can be supplied with optional AGD-1.5 in series with AGD-4 for higher gas flow rates. The AGD-4 is fitted with a changeover valve for vapor recovery to 500 Mbar.

** These are maximum flow rates at full breaker pressure.

*** These are approximate rates.

† The SF₆ VAC Compressor will evacuate the breaker of SF₆ down to a vacuum level of 1.5 HG and will supply to the Haskel Booster Compressor at 1 Bar. It can be supplied with the other models at extra cost.

MIMIC CONTROL PANEL FOR MOBILE SF₆ GAS HANDLING EQUIPMENT



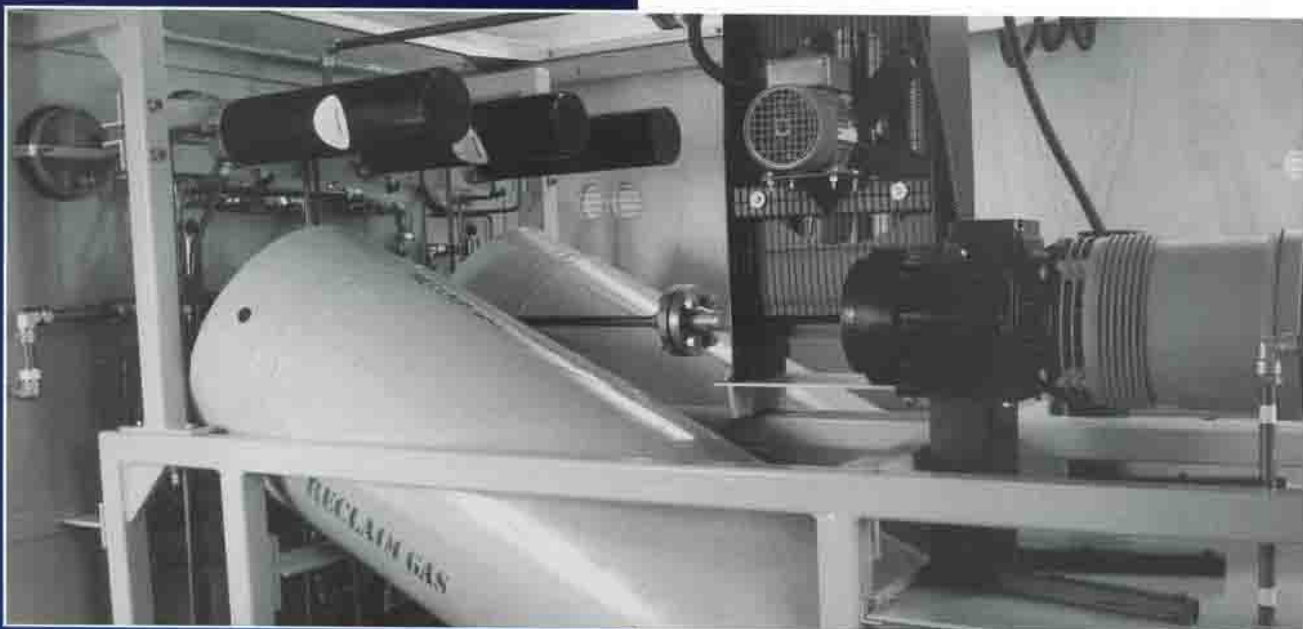
SELECTION

Haskel Mobile SF₆ Carts are all designed to conduct the same basic operation. Correct selection of a cart depends upon the operational time required (i.e., recovery, purification and cooling time) and the storage capacity needed.

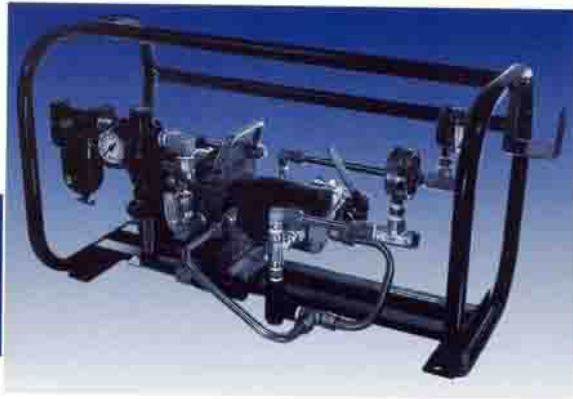
Tank size(s) should have sufficient capacity to hold the quantity of gas contained by the largest H.V.

equipment (i.e., circuit breakers) being serviced.

A number of factors may affect the total operational time such as correct evacuation procedures, distance between equipment and the cart, etc. Please consult with your nearest Haskel plant or dealer for assistance with your particular specification and application.

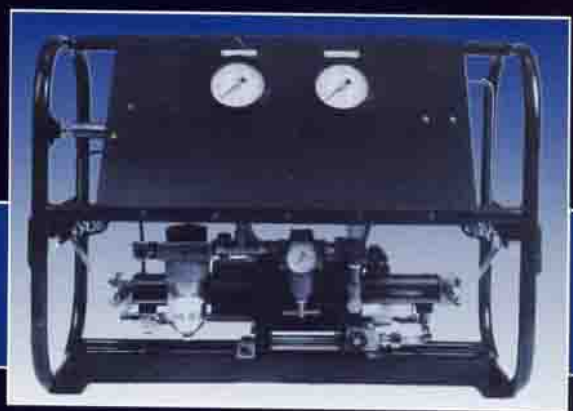


Interior of Mobile SF₆ Gas Cart — Model SF₆-400



**PORTABLE SF₆ TRANSFER UNIT
MODEL 52059**

The Haskel Model 52059 transfer unit will transfer either liquid or gas between cylinders, or cylinder-to-circuit breakers, or to a treatment cart. No heat is generated during liquid transfer and the unit can run dry without damage. It will empty a cylinder as low as 20" HG. Only 60-150 psi (4-10 bar) compressed air or nitrogen cylinder supply is required to generate pressures up to 500 psig (35 bar), making it particularly suited to remote sites without a compressed air facility. It is fitted with speed and pressure controls plus valves for two-stage compression. Additional features can be incorporated as required. It can be supplied frame mounted, or on a wheeled unit.



**NITROGEN GAS BOOSTER
MODEL 51786**

Haskel's Model 51786 Nitrogen booster is used to "top up" accumulators in gas circuit breakers. Pressures up to 2600 psig (180 bar) are usually required for "topping up," which is easily achieved by this compact two-stage booster compressor with 5000 psig (345 bar) rating. It can be driven by a 100 psig (7 bar) compressed air supply, or "boot strapped" directly from the nitrogen cylinder. It can be pre-set to pressure required and left unattended. If gas drops below 150 psig (10 bar), the unit will stall. 90 to 95% of available nitrogen is used without the need for banks of cylinders "cascading" to achieve charging pressure. Only two or three 2000 psig (135 bar) cylinders are required for most sub-stations.



**MOBILE REFILL/EVACUATION CART
MODEL 80918**

Haskel's "stand-alone" gas refilling/evacuation hand cart contains a vacuum pump for evacuating equipment down to 0.0295 in. HG (1 mbar) to ensure that there can be no contaminating air present when clean SF₆ gas is induced to fill the vacuum created.

It will operate at 0.5 ft./min (9.5 m/hr) and includes high-performance Haskel pressure regulators, exhaust filters, valves and gauges.

The Model 80918 cart includes facility for one standard SF₆ cylinder and 6-meter quick-coupling hose and flying electrical head. It can be used also in conjunction with our Model 52059 portable transfer system to make a very compact package.

CAUTION
HIGH-PRESSURE GAS
CAN BE DANGEROUS IF
HANDLED IMPROPERLY.

ACCESSORIES

Haskel offers a range of accessory equipment for use in conjunction with its SF6 carts and systems.

- Gas pressure reducing regulators, valves, filters, cylinders and pressure gauges.
- Liquid and gas transfer hoses.
- Analytical instrumentation for moisture content, analysis, O₂ content, acidity and decomposition products.

Please consult factory or dealer for further information and assistance.

As our name implies, Haskel International, Inc. is a global company with manufacturing and assembly plants in the U.S.A., U.K., France and Germany. Haskel International, Inc. has offices in all of the above locations, as well as Holland, Singapore and Australia. Together, these facilities, with a worldwide trained and stocking distribution network, ensure that we provide the best in international support be it technical, spares or service.



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