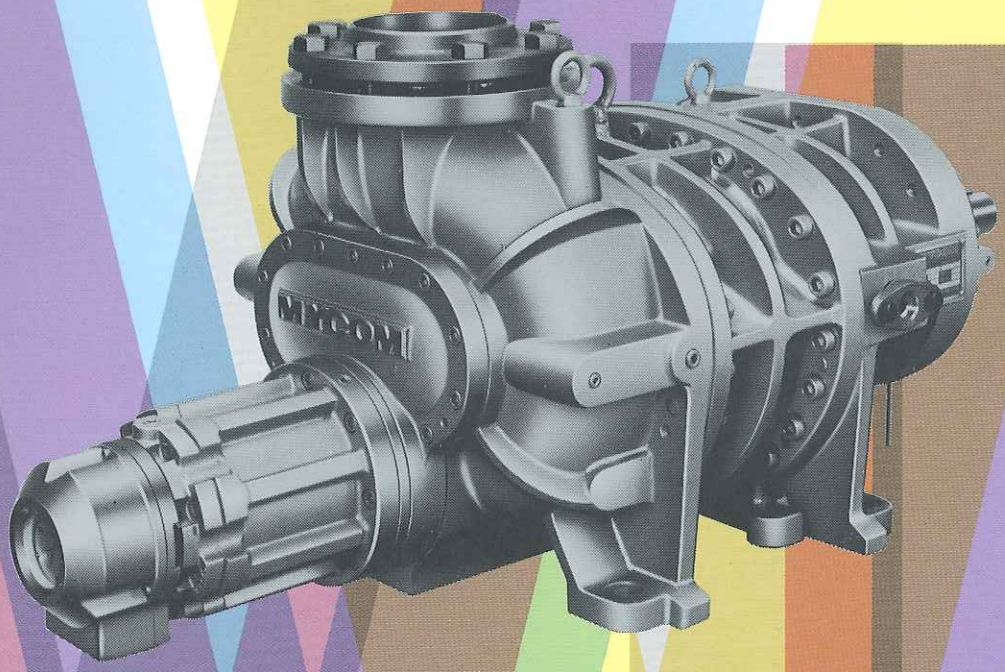
MYCOM

"V" series

Futuristic screw compressor with variable internal volume ratio (Vi)

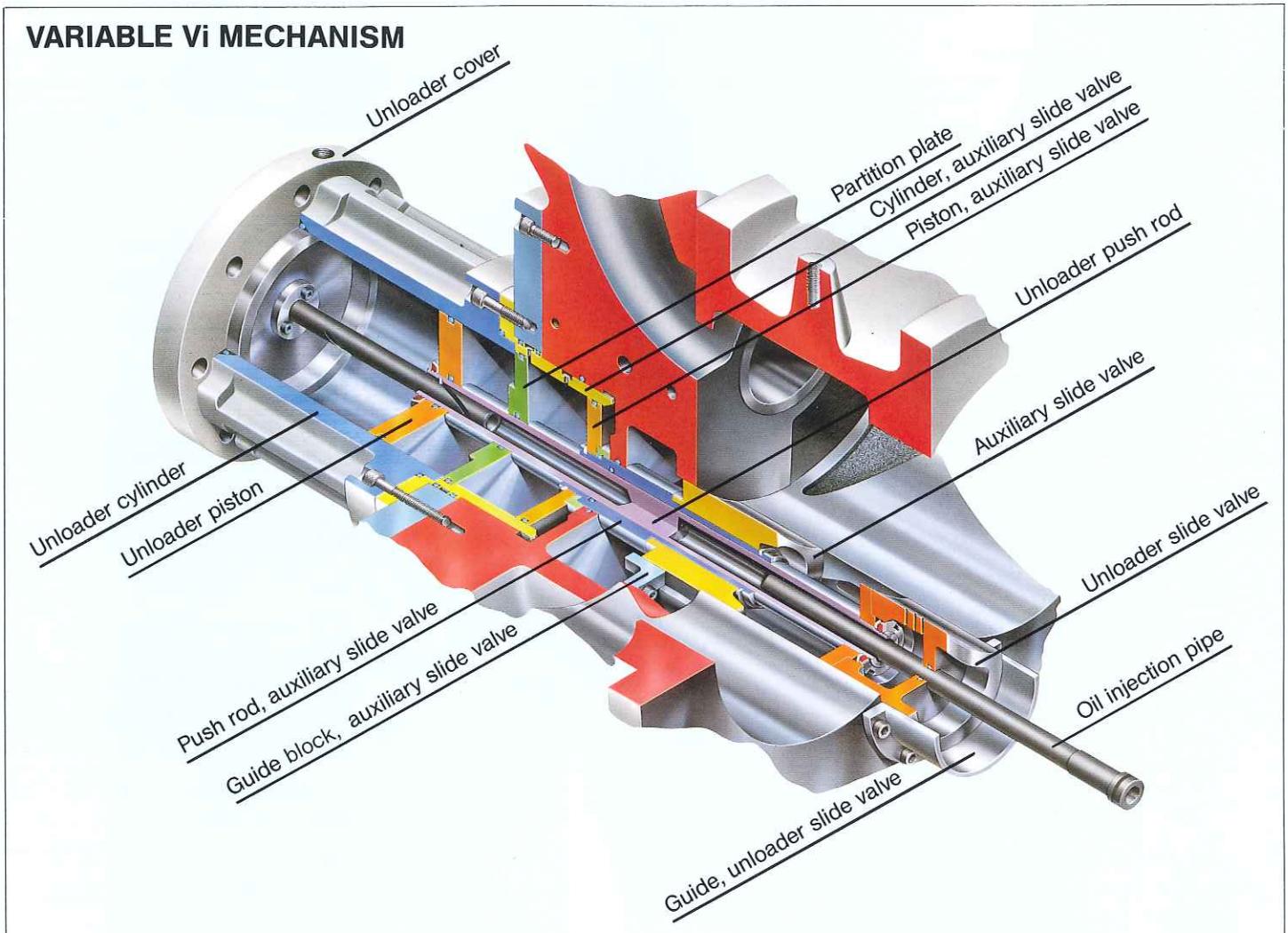
With the "V" series screw compressor, energy and cost saving accelerate to a new high.



PATENT PEND.

The MYCOM "V" series. The first screw compressor that converts freely to suit its role.

VARIABLE Vi MECHANISM



Designed by specialists for specialists, the "V" series broadens the boundaries of plant engineering with performance born of high technology. It's the first screw compressor that converts itself without restrictions to meet operational demands.

● **Energy savings —**
"V" series vs. standard screw compressor:

Reefer vessels

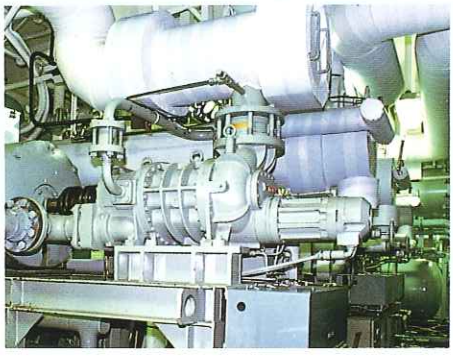
(cargo – bananas)	
Power requirement	20 percent less
Capacity	2 percent increase
C.O.P.	28 percent increase
(cargo – frozen foods)	
Power requirement	6.5 percent less
Capacity	Equivalent
C.O.P.	7 percent increase

Air heat-source heat pump systems for building airconditioning (construction site – Tokyo)

(when cooling)	
Power requirement	8 percent less
Capacity	0.7 percent increase
C.O.P.	9.5 percent increase

Gas force-feeding equipment

Power requirement	7 percent less
Capacity	2.4 percent increase
Adiabatic efficiency	10 percent increase



*For detailed data of energy savings, contact the MYCOM office nearest you.

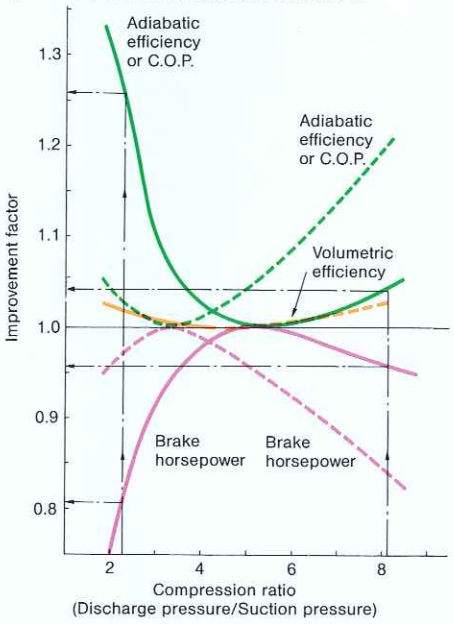
Unlike a fixed Vi screw compressor, the "V" series can be "geared" to meet plant requirements as the need arises.

The two typical and more or less unavoidable examples of varying operating conditions at a compression plant are changes made to comply with process requirements and changes necessitated by an atmospheric or environmental factor.

In both cases, the weak point of a conventional fixed Vi screw compressor is that it cannot satisfy plant engineers who want economical operation under all operating conditions.

The strong point of the "V" series is that it does meet these as well as other important cost requirements.

● Improvement factor
("V" series vs. standard screw compressor)



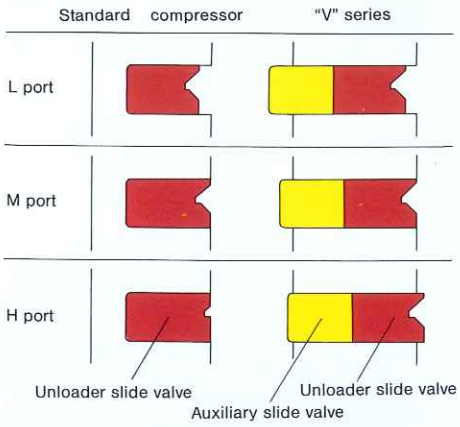
Solid line . . . . M port (Fixed Vi 3.65)
Dotted line . . . L port (Fixed Vi 2.63)
Model F160LUD2-V
Revolution . . . 3000 rpm
Refrigerant . . . R22

$$\text{Improvement factor} = \frac{\text{Brake horsepower "V" series}}{\text{Brake horsepower (Standard screw compressor with fixed Vi ... M port or L port.)}}$$

The "V" series is three compressors in one. The size of the discharge port varies during operation. The power saving accelerates to 20 percent.

Ordinary screw compressors have three fixed internal volume ratios – L, M and H – and allow generalized selection prior to operation. During operation, however, they cannot accommodate power loss resulting from over-compression or under-compression resulting from varying conditions.

● View of slide valve from above



The "V" series can. This new compressor's internal volume ratio can be varied among three levels – 2.63 (L), 3.65 (M) and 5.80 (H) – during operation, allowing a setting closest to the load requirement. This, in effect, makes the "V" series three compressors in one.

In cooling and freezing, the new compressor meets widely varying demands and is capable of operating at peak efficiency. C.O.P. is improved as much as 28 percent and brake KW reduced by 20 percent compared with a fixed 3.65 (M port) Vi compressor at the evaporative temperature of +5°C (41°F) and condensing temperature of +35°C (95°F).

The construction is identical to that of the standard screw compressors except for the variable Vi mechanism. Part-load operation is also possible.

In a conventional screw compressor, the end of the unloader slide valve – the slide stop portion – is incorporated in the rotor casing. The position of the radial discharge port – the circumferencial part of the rotors – is changed by the length of the unloader slide valve.

With the "V" series, the position of the radial discharge port can be freely controlled. The slide stop portion is a movable auxiliary slide valve that travels with the unloader slide valve. It is a simple arrangement, yet it requires sophisticated technology for success.

The two slide valves are operated by switching oil pressure and a separate piston. If only the unloader slide valve is operated, part-load operation can be achieved in the same way as with a standard screw compressor.

The "V" series ushers in a new era of compressor utility. Over 100 units are already proving their worth in service now throughout the world.

A typical "V" series application is the "Rafia Universal", a reefer vessel with a hold space of 11,330 cubic meters (400,000 cubit feet).

The "Rafia Universal" can carry bananas, vegetables and frozen foods over worldwide routes at hold temperatures ranging from +5°C (41°F) to –30°C (–22°F). It is equipped with three 160L "V" series having a total capacity of 1,989,000 Kcal/h (7,892,000 btu/h) at Te +5°C (41° F) and Tc +35°C (95°F). Forty similar vessels are scheduled for service, and some are at sea now.

"V" series applications are expanding to other fields also – gas force-feeding equipment, air heat-source heat pump systems for building airconditioning, multi-stage heating heat pump systems, river water heat-source district heating heat pump systems for frigid regions and continuous slow freezing equipment, and so on.

Six models are available – 160S, 160L, 200S, 200L, 250S and 250L – covering from 55KW to 300KW.

This new compressor's flexibility and accuracy meeting widely varying operating conditions is another step toward absolute control of temperature.

At MYCOM, new developments for progress are an important part of our everyday production program. We want what you want – for machines to better suit the future needs of people in industry and their working environment.

Internal Volume Ratio (Vi)

With screw compressors, the internal volume trapped by the meshing rotors and the casing is decreased and gas is compressed as the rotors rotate. When the volume reaches a certain value, connection is made at the discharge port – that is, the discharge port opens – and compressed gas is discharged. The degree of the decreased gas volume just before connection with the discharge port is termed the "internal volume ratio (Vi)" and is determined by the following formula:

$$\text{"Vi"} = \frac{\text{Vs}}{\text{Vd}}$$

Vs: Volume of the trapped gas pocket immediately after the suction phase is completed.

Vd: Volume of the trapped gas pocket immediately before the discharge phase begins.

In other words, "Vi" is the ratio of maximum internal gas volume immediately after the suction is completed to the minimum internal gas volume immediately before the discharge port opens.

The fixed discharge port of standard screw compressors is classified into L, M and H port types to assure economical operation under specific operating conditions.

The fixed internal volume ratios (Vi) of L, M and H ports is 2.63, 3.65 and 5.80, respectively. With a screw compressor having an M configurated port, for example, the volume of the trapped gas pocket is designed to open the discharge port when the final volume is decreased to 1/3.65 compared with the maximum internal suction volume.

Shortcomings of a fixed Vi

With screw compressors, the internal volume ratio (Vi) during full load operating conditions is determined by the location – size – of the discharge port provided on the casing.

To change the internal volume ratio of a standard screw compressor, disassembly of the compressor, replacement of component parts and additional machining to relocate the discharge port are required due to the structure of the fixed type internal volume ratio (Vi).

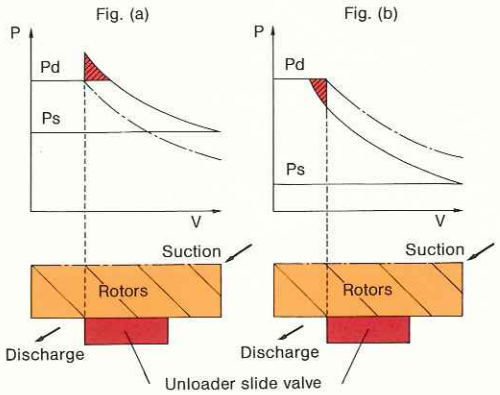
With standard screw compressors, therefore, the peak efficiency can be obtained under specific operating conditions corresponding to the fixed internal volume ratio.

Under different operating conditions, significant power loss is unavoidable. Consider a low compression ratio – high suction pressure or low discharge pressure – operation using an M port (intermediate compression ratio) screw compressor, for example: an excessive compression occurs since the gas will be compressed to a pressure higher than the required discharge pressure before the discharge port opens. See Fig. (a), over-compression.

Conversely, a high compression ratio – low suction pressure or high discharge pressure – operation using an M port compressor results in under-compression since the discharge port will open before the gas has reached the required discharge pressure and the gas in the discharge pipeline will counterflow into the discharge port. See Fig. (b), under-compression.

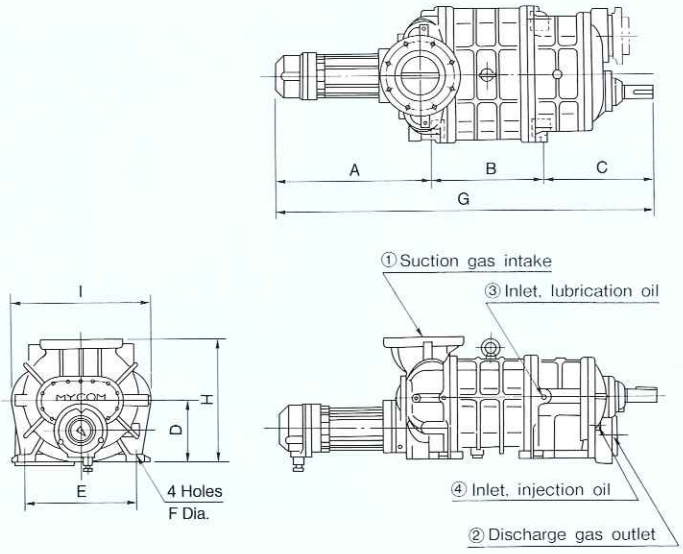
In both cases, a power loss – shown by oblique lines in Fig. (a) and Fig. (b) – and efficiency decrease of the compressor results, leading to higher user operating costs.

● **Over-compression and under-compression**



Pd = Discharge pressure
Ps = Suction pressure
P = Pressure
V = Volume of the trapped gas pocket

● **Outer dimensions**



Model		160SUD-V	160LUD-V	200SUD-V	200LUD-V	250SUD-V	250LUD-V
		mm inch	mm inch	mm inch	mm inch	mm inch	mm inch
Dimensions	A	497.5 19.59	497.5 19.59	514.5 20.26	569.5 22.42	602.0 23.70	674.0 26.54
	B	280 11.02	370 14.57	363 14.29	475 18.70	430 16.93	570 22.44
	C	360 14.17		407 16.02		470 18.50	
	D	210 8.27		260 10.24		320 12.60	
	E	370 14.57		460 18.11		580 22.83	
	F	ø19 ø0.75		ø23 ø0.91		ø23 ø0.91	
	G	1137.5 44.78	1227.5 48.33	1284.5 50.57	1451.5 57.15	1502.0 59.13	1714.0 67.48
	H	410 16.14		510 20.08		640 25.20	
	I	460 18.11		560 22.05		700 27.56	
	①	125A 5		150A 6		250A 10	
	②	100A 4		125A 5		150A 6	
	③	PT1/2		20A 3/4		25A 1	
	④	PT3/8		PT3/8		PT1/2	

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