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T. Fujiwara  
*Toshiba Corporation*

E. Aikawa  
*Toshiba Corporation*

M. Okuda  
*Toshiba Corporation*

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## ANALYSIS OF A NEW TYPE COMPRESSOR

Takayoshi Fujiwara, Eiichi Aikawa, and Masayuki Okuda  
Fuji Works, Toshiba Corporation  
336, Tadewara, Fuji, Shizuoka, 416, Japan

### ABSTRACT

A new type compression mechanism named 'Helical Blade Compressor' was presented at Purdue conference in 1992. There showed the design, performance of prototype, and theoretical analysis. Since then, fundamental experiment and theoretical analysis have clarified the phenomenon of the compression process. The gas is compressed in accordance with design theory of Helical Blade Compressor. This paper shows its potential by testing result of compression process against those of the other compression mechanism, rotary, screw, and scroll.

### INTRODUCTION

Compressor evolution has moved from the reciprocating type to the rotary and scroll types, while the compression cycle has evolved from the intermittent process to continuous. The development has made a great contribution to achieving high efficiency. Especially, compression loss has decreased because continuous compression minimizes the pressure difference between the chambers, and non-valve mechanism. The Helical Blade Compressor is to be regarded as the successor compression mechanism which can realize even higher efficiency.

#### Structure and features

The Helical Blade Compressor is a unique compressor. Its main parts and the compression process are shown in Fig.1 and Fig.2.

This compression mechanism consists of 3 main parts, which is cylinder, rotor piston, and spiral blade. Rotor piston is a columnar part with a spiral groove on its outer surface. The pitch of spiral groove varies gradually from one end of rotor piston to the other. The spiral blade is made of elastic material, that can be easily set in the spiral groove at an uneven pitch. The rotor piston is located offset inside the cylinder, and the surface of rotor piston keeps in contact with the cylinder inner surface. Then the spiral blade divides the space between the cylinder and rotor piston into several compartments, each acting as a compression chamber.

While the rotor piston rotates inside the cylinder, that chamber moves in the axial direction. The volume of the chamber can be reduced from the suction side to the discharge side since the pitch of spiral groove decreases. The pressure in the chamber increases along the rotation.

This mechanism has three key features.

1. Low noise and low vibration due to a non-valve and continuous compression mechanism
2. High efficiency due to low leakage

cooling efficiency may be achieved by employing a staged (combined) compressed gas cooling process through several coolants with different properties in multisection gascoolers. The results obtained from theoretical and experimental investigations as well as the described complex approach to the optimization of such gascoolers allow to find the most effective employment of multisection gascoolers in compressor installations.

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