INTRODUCTION

The purpose of this paper is to outline the various options available to the user of air-moving blowers. All such blowers have their advantages and disadvantages with no one construction perfect for every application. It is hoped that with a thorough understanding of the performance characteristics and principals of design of all blowers, we can better allocate our sales efforts to the application of CONTINENTAL INDUSTRIE products in those areas in which they are best suited. Although it is not good practice to “bad-mouth” the competition, the obvious deficiencies and disadvantages of fans and positive displacement type blowers should be pointed out while stressing the merits of CONTINENTAL INDUSTRIE’s method of construction.

CENTRIFUGAL BLOWERS

Centrifugal blowers such as those manufactured by the CONTINENTAL INDUSTRIE Company are multi-stage. Blowers utilize simple centrifugal force in order to develop pressures up to 15 PSIG. Air enters an impeller that is revolving at sufficient speed to increase the velocity. This velocity energy or centrifugal force is converted to a desired pressure. To obtain the pressure, CONTINENTAL INDUSTRIE utilizes a multi-stage arrangement in which a number of small impellers rotating at moderate speeds could be staged in series so that a small pressure boost would be obtained in the first stage with the discharge air entering a second stage where it is further boosted.

With a multi-stage arrangement, the peripheral velocity and centrifugal strains are so greatly decreased as to make possible a low speed, wide clearance machine running under light strain. The result is a quiet, sturdy blower, not subject to failure.

As the only contacting parts are the bearings, the only maintenance required is periodic bearing lubrication. Bearings are outboard mounted thus eliminating the need to remove oil from the air stream. Delivered air is clean and oil free. The performance characteristics of centrifugal blowers are such that a relativity constant pressure is obtained from 0 flow out to maximum rated volume without pulsation. As volume of air delivered decreases, so does horsepower.
**POSITIVE DISPLACEMENT BLOWERS**

*(ROTARY LOBE)*

Rotary lobe blowers operate on the positive displacement principle whereby (2) figure 8 lobe impellers mounted on parallel shaft rotate in opposite directions. As each impeller lobe passes the blower inlet, it traps a definite volume of air and carries it around the case to the blower outlet where the air is discharged. Pressure is developed by compressing the discharge air against a downstream resistance. Due to their close running tolerances, positive displacement blowers are more efficient at designed operating speed when new. However, the same precise internal clearances rapidly deteriorate through usage causing a reduction in efficiency. After a year or two, positive displacement blowers must be returned to the factory for seal, bearing, impeller or shaft replacement. Positive displacement blowers are best used where constant volume and variable pressure are required. They are capable of developing pressures up to 15 PSIG. Most positive displacement blowers require internal lubrication system and therefore, oil must be filtered out of the air stream. Most are belt driven thus requiring the diligent upkeep and maintenance associated with such arrangements. Inherent in the construction of all positive displacement blowers is discharge air pulsation and high noise levels. Due to the heavy weight of such blowers, special foundations are required.

**ROTARY VANE BLOWERS**

Rotary vane blowers are positive displacement type and like rotary lobe blowers provide variable pressure at constant flow. They incorporate a series of 4 or more carbon vanes which trap a definite volume of air as they rotate past the inlet and carry it around the case to the blower outlet where it is discharged. Like rotary lobe blowers, air is compressed against a downstream restriction. Rotary vane blowers deliver a constant volume of air at discharge pressures of up to 25 PSI. Maximum volume is in the range of 50 CFM. The series of rotating carbon vanes on the internals of such blowers are forced to rub against the inside of the casing causing wear. This action also causes small amounts of carbon dust to enter the discharge air. Like rotary lobe blowers, most must be belt driven. Therefore, diligent maintenance and replacement of wearing parts is mandatory.
**CENTRIFUGAL FANS**

Centrifugal blowers or fans are similar to turbo blowers in that they have relatively flat pressure curves. Air enters the center of a rotating impeller on which there are a number of fixed veins. Through centrifugal action air is forced to the outside of the impeller where it is discharged. Such blowers normally deliver relatively low discharge pressures (2 PSI or less) and are best suited for applications where a large volume of air is required. The volume of air that these blowers are capable of delivering ranges from 20 CFM to 60 000 CFM. As stated above, these volumes of air would be delivered at very low discharge pressures (normally 6" of water or less). Higher pressures can be obtained by increasing the impeller periphery speed through the use of high speed belt drive arrangements. However, these high speeds seriously reduce the life of the bearings. Due to low discharge pressure, these machines are best classified as fans and not blowers. They are most commonly used in heating and ventilating systems, as exhausters, as cooling fans, etc...

**REGENERATIVE BLOWERS**

Regenerative blowers are single-stage units whose impellers are constructed with several vanes. As the impeller rotates, air between the vanes is acted upon by centrifugal force and moves to the periphery of the impeller. From there the air is directed to the casing which is constructed so as to direct the air flow back to the base of the impeller vanes for recirculation in the same manner. This circular flow in combination with the revolution of the impeller causes air to follow a spiral path through a regenerative blower with the result that air is under constant acceleration. This "regeneration" of air pressure with one revolution allows regenerative blowers with one stage to develop pressures equivalent to those developed by multi-stage blowers. Unlike positive displacement blowers, which develop constant pressures with variable pressures and turbo blowers which develop constant pressures with variable volumes; regenerative blowers have both variable pressure and volume. If a restriction were placed anywhere in the air moving system, less than the maximum rated volume of the blower would be allowed to discharge. The remaining air would stay in the blower longer thus allowing it to recirculate more and develop a higher pressure. Therefore, by varying the amount of air that is allowed to discharge, the discharge pressure is also varied. Relatively maintenance-free service is provided due to their simple construction. Regenerative blowers operate at relatively moderate speeds with the only contacting parts being the motor bearings. All regenerative blowers are direct drive thus eliminating the upkeep associated with belt-drive and gear driven arrangements. All incorporate sealed ball bearings which are permanent greased and deliver a clean oil-free, dust-free non-pulsating air flow. In addition, regenerative blowers are extremely quiet thus eliminating the need for costly mufflers.