A. GENERAL DESCRIPTION
Automatic spray painting machines can be designed to coat almost any type of product regardless of shape, size, color or material. The basic design of these machines will conform to one of the following type motions, excluding minor changes which may be used to suit the particular product.

1. Horizontal Reciprocating Machine
This coats flat objects such as steel plate, plywood, etc., which can be carried on a lay-down conveyor under the spray gun. The motion of a horizontal reciprocating machine, together with the movement of the conveyor, may be described as a series of "W"s. The spray guns are fixed at right angles to the surface of the product. When using one spray gun with a 6 inch spray pattern, the product will move 3 inches for every stroke of the machine. For a more uniform coat, an overlap is provided to cover the previous stroke using one half of the effective portion of the spray pattern of the previous strokes. The spray gun moves six inches past the product and is turned off. The gun is turned on six inches before starting the next stroke. Triggering the gun helps to keep the fluid nozzle clean. Recommended for up to 25 feet per minute conveyor speeds.

2. Vertical Reciprocating Machines
Designed to produce a vertical stroke, these machines are normally used in conjunction with overhead conveyor systems, but can be adapted to other types.

The design of these machines and controls are determined by the size, shape, type of material being sprayed, production requirements and budget allowed by the customer.

3. Rotary Spray Machines
These do the same basic operation as a horizontal reciprocating machine, but are able to operate at higher conveyor speeds. The machine rotates at about 20 RPM and the spray pattern coverage in conjunction with the conveyor, covers the object with a series of overlapping arcs—the flatter the arc, the more uniform the coating. Four arm rotary spray machines are recommended for up to 50 feet per minute. Eight arm rotary spray machines are recommended for any conveyor speed over 50 feet per minute. A limitation of this machine is that it cannot handle abrasive materials because of the rotary seals it uses.

4. Spindle Machines
An automatic spraying system consisting of exhaust system, conveyor (chain on edge type) and spray gun controls with the exception of loading and unloading portion (*optional equipment). Most types of products coated with this machine conform to spherical or cylindrical shapes. Square shapes require two rotational units. The object is placed on a specially designed workholder and rotated or spun in front of one or more spray guns. For a fine uniform finish the product must be rotated at least a minimum of two revolutions in the front of each spray gun.

Depending upon the shape and size of the product, the minimum spacing of the work holder is normally every other pin; greater spacing between work holders can be as desired. The spindle conveyor chain is available in 1½, 2, or 3 inch pitch, depending on requirements. Conveyor path can be arranged to suit the individual needs.

5. Robots
Robots are spraying machines that virtually duplicate complex human hand, wrist, and arm motions. They are computer-controlled for production line spraying and offer particular advantages in hazardous areas, and where the work is repetitive. Robots can be powered either electrically or hydraulically and are well suited for precision work.

6. Short Stroke Reciprocating Spray Machines
Sometimes called oscillators, SSRM normally oscillate over a range of 1 to 24 inches with adjustment capability in 1-inch increments. They can be oriented for either vertical or horizontal motion.

7. Automatic Spray Machines for Mouldings
Used in the finishing operation of flat and profiled mouldings, either continuously or intermittently for strip lengths in any combination. Capable of high production speeds (up to 36,000 ft. per hr.) these machines can be mounted with up to four spray heads, each individually controlled. Spray booths usually are not required since exhaust systems are integral with the machine.

B. ADVANTAGES
1. Uniformity of the coating on the product.
2. Cutting down of product rejections.
4. Paint savings.
5. In most cases, production rates can be increased.

C. JUSTIFICATION OF COST
1. Material savings.
2. Increased production.
3. Improved product quality.
4. Finish uniformity.
5. Labor savings.
D. CONSIDERATIONS IN SELECTING A PIECE OF AUTOMATIC SPRAY EQUIPMENT
1. Size and configuration of product.
2. Conveyor speed—maximum and minimum.
3. Production requirements (to include future plans).
4. Film build and finish required.
5. Types of spray guns being used.
6. Method of material atomization (airless or conventional).
7. Types of spray systems: hot spraying, electrostatic, circulating or dead end.
8. Type of conveyor.
10. Spray booth size.
11. Spray booth type—waterwash or dry type.

E. OPERATION
1. Material is supplied to the automatic spray machines by standard pressure tanks or pumps for conventional applications, and airless high pressure pumps for airless spraying, or where production warrants, the circulating system is used for supply.
2. The spray guns cover the product with a spray pattern which is perpendicular to the surface. Triggering the spray guns at the end of each stroke, overlapping at the same rate, and maintaining the proper spraying distance produces the required uniformity of the coating.

F. LIMITATION
1. The size and configuration of the object to be coated.
2. The film thickness required in one pass through the machine.
3. Cost of the equipment must be justified in material savings, production increase and/or product uniformity in one or two years.

G. TRANSFER DEVICES/PICK-AND-PLACE UNITS
When automatic transfer of parts is required from one conveyor to another, e.g. spindle conveyor to belt conveyor or over/under conveyor to belt conveyor.

H. CONTROLS
The controls that are available on these automatic spray machines can be either semiautomatic or fully automatic. The controls can be designed to have the ability to identify the shape and size of the product and coat only its surface area with minimum overspray. Automatic color changing units are available to change from one color to another. Skip spray devices are available in order to prevent spray guns from operating when there is no product present on the conveyor.

A special device which has the ability to carry out skip spray function, is a pin memory ring mounted singly or in a series. The memory ring is connected to a parasitic drive which powers and moves the memory ring in direct relation to the conveyor speed. Each ring is connected to a sensing device mounted along the conveyor. This may be a switches or a photo cell. As the part passes the sensing station, a signal is given to the timer unit. This signal energizes a solenoid which extends a number of pins in the rotating ring. For example if each one of the 100 pins could have a memory assignment of 4 inches across the product, the ring would retain this information for a distance up to 400 inches. By varying the memory assignment or using additional rings longer distances can be obtained. The pins, moving in time with the conveyor, advance to an output switch mounted in the unit. The switch is activated by the pins, and in turn, sends a signal to activate the spray gun. While this has been taking place, the part has been moving on the conveyor until it is in spraying position at the same time the spray gun is activated. This type of control permits us to spray when the part is in position; and we can determine the approximate shape of the part, and reducing waste and maintenance.

If more sophisticated control methods are required, computer controlled (PLC) machines are also available.

I. DOES YOUR PRODUCTION WARRANT AUTOMATION?
1. High production rates.
2. Similarity of products.
3. Same type of material being used.
4. Uniformity and quality finish required.

J. PURCHASE OF EQUIPMENT
There is limited catalog information available on automatic systems since each unit is designed for standard components to meet the requirements of each particular operation. Each automatic machine is assembled on an individual order basis to meet the particular specifications of the customer.
Automatic Test Panel Spray Unit—A programmable machine used to spray panels for laboratory use in determining number of coats, color, speed of application, etc.

Cross Slat Conveyor—Used when the product is heavy or not self supporting.

Horizontal Reciprocating Machine—A painting unit designed to effect a horizontal, or back and forth, spraying stroke on flat or contoured surfaces—usually used with horizontal or floor conveyors.

Over/Under Conveyors—A fully automated conveyor which loads, sprays and unloads large diameter 6–24 inches) products traveling through the spray system.

Parasitic Drive—A mechanical device that obtains its power from some other power source. (Example: the power to operate the pin memory ring is obtained from the conveyor's movement.)

Perlon Filament Conveyor—Widely used in the tanning industry; most materials used will not stick to the perlon filament, looks similar to a cable conveyor. Perlon filaments are used with lightweight products and at normal room temperatures only.

Pin Memory Ring—An electro-mechanical control device that uses a memory-delay principle to control spray guns, counters, conveyors, etc.

Pin Type Conveyor—Pins mounted on slats which support the work and permits air circulation—normally used where excessive paint build-up is encountered.

Pitch—The distance between one pin of a chain and the other pin. ie, bicycle chain.

Roller Coater—A painting unit which applies a coating to a flat surface with a series of rollers, similar to a printing press.

Rotary Spray Machine—Spray guns are mounted on the end of arms radiating from a central hub; these arms are caused to rotate at the appropriate speed and the spray guns are automatically triggered (used on high speed conveyors spraying flat work).

Spindle Machine—A painting machine which conveys the product, on workholders, past the spray guns which are closely controlled; the product may be caused to rotate to increase painting effectiveness.

Steel Cable Conveyor—Used mostly for self supporting products such as plywood, etc.—minimizes paint build-up.

Three Way Valve—Is used to operate the air cylinder of an automatic spray gun; provides very fast actuation of the spray gun.

Vertical Reciprocating Machine—A painting unit similar in design to above, but produces an up and down spray stroke—usually used with an overhead conveyor.

Wire Mesh Conveyor—Made of wire mesh to support the product and air in forced drying.
K. STANDARD AUTOMATIC SPRAY GUNS. PNEUMATICALLY OPERATED.
These spray guns are adaptable to all types of automatic machines previously described.

Model 21
Heavy Duty, Air-Atomizing

Model 61 HTE, Air Atomizing High Production Duty with special Nozzle Tip for High Transfer Efficiency Systems.

Model 550
High Production Duty, Airless

Model 80, Electrostatic High Production Duty, Air-Atomizing