Introduction :

An air curtain is a device that is installed on the doors of commercial, industrial, food, etc. This device prevents the passage of airborne particles and energy exchange by creating an insulating layer of air. Air curtains can be used for heating and cooling and also prevent air particles, insects and pollutants. The air curtain is a device that uses a fan to efficiently separate two different environments without restricting the access of people or vehicles and creates an invisible air barrier on the entrance. This device can be a form that prevents the entry and exit of insects and entrances, as well as the entry and exit of internal heat and coldness. The air curtains are mostly used in stores and buildings which are crowded.

Bugs in the performance of the air curtain device:

The air coming out of the air curtain device has energy due to its weight and high speed, and as you can see, the result is shown as a vector. Similarly, the wind has energy and is defined as a vector in the opening of the door. The collision of these two vectors also leads to the creation of a third vector.

If the power of the air curtain device is greater than the wind power, the third vector (air flow) tends to the outside and vice versa. If the wind power is greater, the third vector returns to the inside. Therefore, air curtain devices must be designed in such a way that they can create balance in front of the opening of the entrance door

Smart air curtain:

This device is designed in such a way that selects the best performance by having a very strong controller and several sensors and continuous monitoring of the ambient and internal temperature. This device is a combination of an air curtain device and an air purifier. As long as the door is closed, the device starts disinfecting and sterilizing the air by UVC lamp and as soon as the device door is opened, it will change the mode and work in air curtain mode. This device has two working modes:

1- Air curtain: If the device door is open, it works in air curtain mode.

2- Air purification: If the device door is closed, it starts to purify the air using UVC lamp radiation.

1- Device control:

PLC is used to control and make the device intelligent, and HMI is used to monitor the device.

2- Device sensors:

2-1: Room sensor: A temperature sensor is installed in the indoor space, which has the task of monitoring the temperature inside. By monitoring this sensor, the device puts the heaters into the circuit in such a way that the desired air temperature is created.

2-2: Environmental sensor: A temperature sensor is also installed in the external environment, which has the task of monitoring the ambient air temperature. The device adjusts the speed of the outgoing air by monitoring this sensor so that it can overcome the force of the wind blowing on the door opening.

2-3: Pollution detection sensor: This sensor, which is installed in the indoor environment, is responsible for monitoring the amount of gases in the air. The device will continue the sterile operation until the pollutants in the air are reduced to the desired level.

2-4: Door status detection sensor: This sensor is installed on the door and reports to the controller whether the door is open or closed. If the door is closed, the device will be in minimum operation mode to save energy. .