

Study on electrostatic hazard and prevention in polyester granules packing process

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Abstract—In the polyester production process, high insulation polyester chips (PET) tend to be electrostatically charged. In this paper, the surface potentials of the packaging bags were measured, and the electrostatic hazards in the process of PET chip packaging were also discussed. A polyester chip packaging combined-static elimination technology was also introduced to control the electrostatic of packaging system. As a result, the surface potential of the packaging bags can be effectively controlled less than 15kV when the combined-static eliminator was used.

I. INTRODUCTION

The polyester chips materials are widely used in clothing, packaging materials and engineering plastics[1-2]. Non-conductive materials are often highly charged triboelectrically by frictional contact of the individual particles during powder handling processes[3-5]. Therefore, the hazards related to static and electrostatic discharge are some of many hazards(such as ignite flammable dust, cause electric shock to human body and affect the physical and mental health of PET packaging operators) that must be dealt with in the PET packaging process. In this paper, the surface potential of the bag was measured and a packaging combined-static elimination technology was also introduced to control the electrostatic of packaging system, which provides the reference basis for the electrostatic safety management of the material packaging process.

II. STATIC HAZARD OF POLYESTER SLICE PACKING PROCESS

One ton bag was used in a PET packaging (see Fig. 1 for the package diagram). In the polyester chip packaging process, the surface area of the bag is electrostatically charged and a high surface potential is formed. To study the electrostatic properties, the surface potential of the bag in the process of polyester chip packaging was detected by using a EFM-022(KLEINWACHTE, 0V~±200kV).

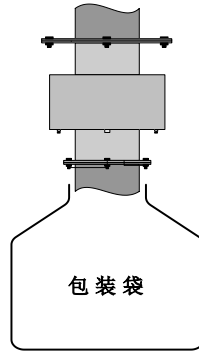


Fig.1. Diagram of polyester chips packaging process

Our measurements of the surface potentials for the packaging bag in the process of polyester chip packaging are shown in Table 1. It can be seen that the surface potential of the packaging bag can exceed 100 kV, which can cause an electric shock when a person comes into contact with a bag.

TABLE 1 ELECTROSTATIC INSPECTION OF PACKAGING PROCESS OF POLYESTER CHIPS

Packer number	Surface potential	Packer number	Surface potential
1	-160 kV	2	-195 kV
1	-146 kV	2	-197 kV
1	-114 kV	2	-195 kV

III. CONTROL OF ELECTROSTATIC CHARGE FOR POLYESTER CHIPS PACKING PROCESS

A charge neutralization method can be used to control the surface electrostatic charge of the packing bag in the process of polyester chip packing[5-6]. Therefore, an electrostatic eliminator can be used to reduce the charge of polyester chips before they enter the packing bag, and several surface electrostatic eliminators can be used separately to reduce or eliminate the static charge on the surface of the packaging bag.

The principle diagram of a polyester chip packaging combined-static elimination system is shown in Fig. 3. The polyester chip electrostatic elimination system was designed and installed: ① An electrostatic eliminator was installed at the outlet of the packing machine to eliminate static electricity carried by polyester chip itself. ② Different surface ion wind static eliminator is arranged in the position of the four pillars of the baling machine, which is used to eliminate the static electricity on the surface of the packing bag. ③ And a human body static electricity eliminator is arranged on the packing machine operating table to eliminate the static electricity of the human body of the operator.

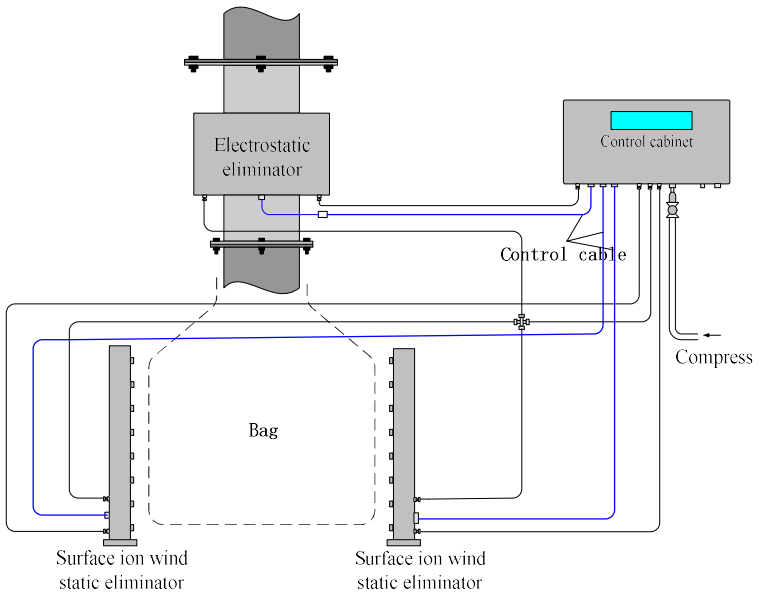


Fig.2. Schematic diagram of combined powder electrostatic elimination system

Table 2. Surface potentials of packaging bags in closed or open state of combined electrostatic elimination system

	Bag surface potentials (kV)	
	closed	open
1	-160	+6.9
2	>-200	+8.2
3	>-200	+7.0
4	>-200	-2.2
5	-156	-2.3
6	-159	+5
7	-189	-7
8		-4.5
9		+4.6
10		+3.0
11		+2.7
12		+5.6
13		-4.1

The surface potentials of packaging bags in closed or open state of combined electrostatic elimination system were shown in Table 2. When the combined-static elimination system was closed, the surface potentials of the bag were much higher than the safety index of 30kV. The data of the surface potentials of packaging bags shows that after the combined electrostatic elimination system is started, the surface electrostatic potential of the detected bag is 30 kV, which is less than the minimum voltage of the human body to produce electric shock.

IV. CONCLUSION

After installing the combined electrostatic elimination system in the polyester chip packing machine, no operator reflects the electric shock of the contact material slice and the bag. Therefore, the electrostatic elimination system is installed in the polyester chip packing machine, which basically eliminates the static electricity of the material, bag and human body, and solves the problems of electrostatic ignition and electric shock in the packing operation.

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