Atex wet wipe production

Çimen Onur.[1,*], Söğüt Oğulcan.[2] Şimşek Yasin Yağız.[3,], Saklakoğlu İbrahim Etem.[4],
KANSAN R&D Center, İzmir, Turkey[1,2,3]
Ege University, İzmir, Turkey[4]
onurcimen@kansanmak.com

Abstract: *Due to the pandemic conditions we have been in in recent years, the need for disinfectant products in the hygiene sector has increased considerably. In this context, in order to meet the disinfectant wet wipes demand, the need to make the existing wet wipe production machines work with alcohol has arisen. In project scope; Wet wipes packaging machine, which is suitable for working with isopropyl alcohol, meets all the necessary conditions and is equipped to prevent the danger of explosion, was built.. Also the equipment to be used within the scope of the project and activities to be performed in the context of the new designs that will be revealed thanks to the alcohol completely reliable and relevant about working with the institutions and approved and fully ATEX compliant packaging machine, wet wipes faster than peers will emerge. By avoiding all possible risks, all possible problems that are undesirable, endanger human health and cause work accidents were prevented.*

Keywords*: WET WIPES PRODUCTION, PACKAGING MACHINE, ATEX*

1. Introduction

The effect of the pandemic, companies needed raw materials and machinery to produce hygiene and disinfection agents. Alcohol based solutions became more prevalent. A new packaging machine was designed by using the working logic of the existing wet wipes packaging machines in order to meet the needs that determine the subject of the project and to make the project successful in this context.

A potentially explosive atmosphere exists when a mixture of air gases, vapours, mists, or dusts combine in a way that can ignite under certain operating conditions. The ATEX directive of EU describes what equipment and workspace is allowed in an environment with an explosive atmosphere. ATEX derives from the French title of the 94/9/EC «Appareils destinés à être utilisés en ATmosphères Explosives» The current directive in effect: 2014/34/EU.

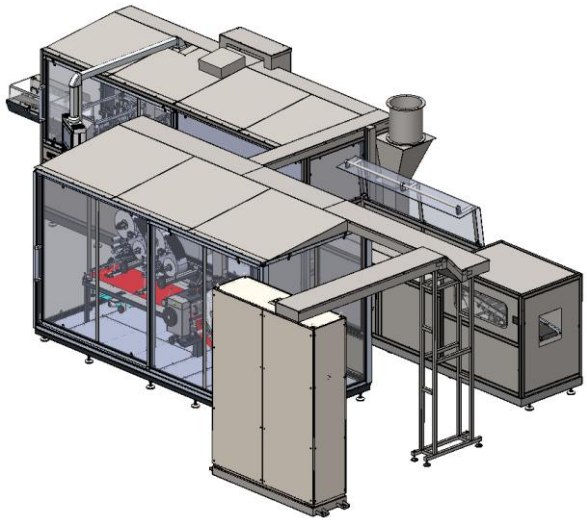

Fig. 1 *3D Atex Packaging Machine.*

The new machine has been designed in accordance with ATEX, with the ability to pack wet wipes soaked in isopropyl alcohol. In this context, all equipment to be used in the machine was selected as ex-proof and the machine design was shaped according to these equipments. The risk areas of the newly developed wet wipe packaging machine were determined and a risk analysis was made and the necessary arrangements were made for the area where the machine will be used. An ATEX conformity report was received for the machine along with the extracted risk zone map.

The sources of sparks that can create an explosion hazard on the machine are specified in the ATEX directive. In accordance with the directive According to the EN 13463-1 directive, a risk analysis table is created down to the smallest equipment of the machines and if there is a risk, the measures to be eliminated are determined accordingly.[1]

Risk factors are; 1- Hot surfaces, 2- Spark sources, 3- Electromagnetic sources, 4- Ultrasonics, 5- Electrical devices, 6- Adiabatic compression, 7- Ionizing radiation [2]

A machine-wide resistance system has been designed against alcohol drips that may occur from stacks of wet wipes soaked in isopropyl alcohol before entering the package. In this way, the flowing isopropyl alcohol will be collected in various dripping pans and removed from the machine by means of a pump. The new packaging machine will be completely isolated from the factory area, preventing the escape of alcohol vapor from the machine. Insulation process was provided by making a special hood for the machine.

The project brought a new development to wet wipes packaging machines in the wet wipes packaging industry. In this way, wet wipe manufacturer companies produced alcohol wet wipes completely safely at the speed of standard wet wipe packaging machines.

A mixture of air and flammable chemical vapor was continuously evacuated. Thus, the gaseous accumulation of the evaporated liquid was prevented. Vapors of chemicals can be heavier than air or lighter than air. The lighter vapors accumulate in the ceiling, and the heavier ones in the floor of the machine. Ventilation channels are placed on the ceiling or under the machine according to the areas where flammable vapors accumulate.

Detailed measurements were made regarding static electricity discharge and device grounding. The machine was monitored with a thermal camera to avoid spot temperature increases. Control of the ventilation system is done with dry ice vapor if the flammable vapor is heavier than air, and with smoke if the flammable vapor is lighter than air.

Fig. 2 *Thermal Camera Testing and Smoke Testing*

2. Materials for Production of Prototype Parts

All mechanical and electrical equipment used in the machine has been selected according to the determined zone map and will be special. Passive antistatic elements were used to prevent sparks on the machine. In this context, both the body glasses and the plexiglass glasses inside the machine will be covered with antistatic film and possible dangers are prevented.

The operability of the machine was optimized according to different packaging types, and the situations requiring an operating temperature higher than the ignition temperature of isopropyl alcohol were equalized, and the system was designed to never exceed this temperature and necessary safety measures were taken.

Motors, electrical equipment, reducers, lightings, pistons, valves, etc. used in the production of ATEX wet wipe machines. equipments were selected from certified components according to the specifications specified in the MSDS document. Since the vapor of the chemical mixed with air poses an explosion hazard, components produced for the gas are generally used.

Table 1: *Atex Marking For Gas [3]*

A

CE 1725 Ex

B ATEX MARKING FOR GAS

II 1G Ex ia IIC T4 Ga

	GAS II 1G Ex ia IIC T4 Ga
Equipment Group	I — Approved for mining
	II — No mining
Equipment Category and Environment	1G — Category 1, use in Zone 0/1/2
	2G — Category 2, use in Zone 1/2
	3G — Category 3, use in Zone 2
Specific marking	Ex — Explosion protection
Type of protection	ia/ib/ic — Intrinsic safety level of the device in Zone 0/1/2
Gas group (divided by explosive potential)	IIA — i.e. Propane
	IIB — i.e. Ethylene
	IIC — i.e. Hydrogen
Temperature Class	T1/T2/T3 — Maximum surface temperature of 450°C / 300°C / 200°C
	T4/T5/T6 — Maximum surface temperature of 135°C / 100°C / 85°C
Equipment Protection Level	Ga/Gb/Gc — Rare failures / predictable failures / regular use

After all the precautions in the ATEX directive were taken and the design, manufacture and documentation of the machine was completed, the certification process was initiated by applying to the certification body. As a result of the examinations and measurements made by the certification body, the machines that met the qualification were given ATEX certificate.

3. Results

The following benefits and outputs were fulfilled in the project;

• Wet wipes packaging machine that can work with isopropyl alcohol was brought to the sector.

• The new wet wipes packaging machine, which was developed thanks to the certificates of conformity to be taken and the safety measures to be followed in the machine design, was presented to the sector in ATEX quality, thus meeting the demand for disinfectant wet wipes production during the pandemic.

• Existing wet wipe packaging machines were brought into compliance with the standards without affecting the efficiency and performance parameters, the production parameters were kept constant without any loss or reduction, and the production of these special wipes continued in the same way.

• Alcohol-based wet wipes are easily produced for the user by using the safety precautions taken, equipment selections according to the risk zones and spark-preventing mechanisms, preventing all possible risks and all problems that may endanger human life.

Fig. 3 *Assembled View of the Atex Packaging Machine.*

4. References

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