

“DEVELOPMENT OF COST EFFECTIVE EPE CAPSEALS & PROPERTY IMPROVEMENT THROUGH DESIGN MODIFICATION IN CO EXTRUSION PROCESS”

PATEL NEHALKUMAR BHARATBHAI, SANDESH K JAIN

CENTRAL INSTITUTE OF PLASTICS ENGINEERING AND TECHNOLOGY, AHMEDABAD.-382445.

ABSTRACT

The title of my project is called to development of cost effective EPE cap seals and property improvement through design modification in co- extrusion process. The purpose of my experiment is to make blasting on high polish steel roller& make surface matte in sheet extrusion process. The process can be done by mechanical blasting.

So in result this matte impression on sheet & there will no need to additives such antiblock & sleep agent& due to matte surface there will no chance to stick each other surface.

1. INTRODUCTION

❖ WHAT IS EPE SHEET ?

It is Expanded polyethylene sheet(foaming sheet) which produced by with the help of physical blowing agent such as co₂.

In this process generally there are two extruder used. 1) Main Extruder 2) Co-Extruder. Material such as LDPE,LLDPE,HDPE,CF Powder,D2 oil, Antiblock & Slip agents are used.

Structure make like this Solid PE/PE foam/Solid PE .

This EPE sheet punched in to press machine with different size of dies as requirement.

This cap seals completely fit in to the cap to prevent leakage.

It is mainly used in cosmetic, food, pharmaceutical and liquor applications.

2. EXPERIMENTAL WORK

2.1 OBJECTIVE OF THE WORK:-

Main important work is to make rough surface of rollers. Blasting is the process where small angular or spherical particles are propelled at a part by Mechanical high speed rotating wheels. And through process comparison EPE sheet with process capabilities.

2.2 ROLLER DESIGN IN CAD:-

In the post Design used o involved over long Spence of time the leisurely pace of technological change to reduces to rick of making major errors the rarely demands analytical capabilities of the designer these was design by evolution development of bicycle form its creak operated variation to its present days chain& spread version over a period of design a centuries is article example of design by evolution.

WHY ROLLER DESIGN

1. To create new product never made before.
2. To create something similar to existing and modification of old product which give more appearance.
3. By developing a matte surface on roller, to reduce the material cost in final product
4. Process become economical.

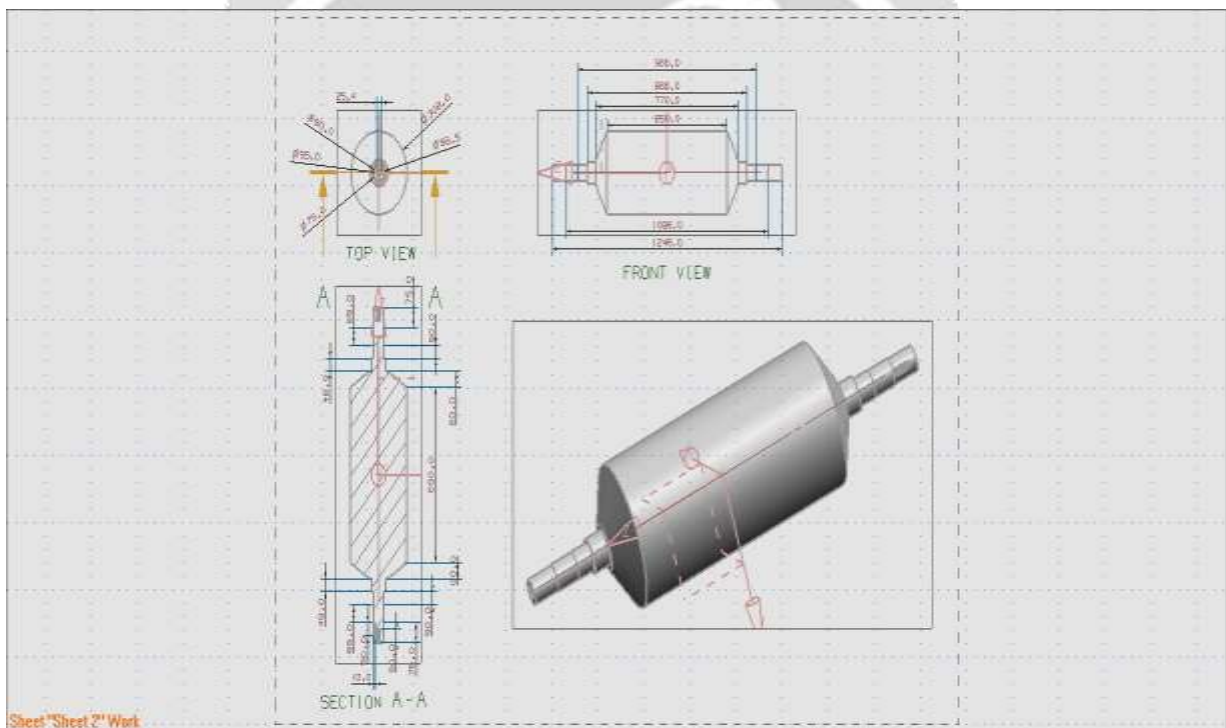


Figure: - Roller design by CAD Software.

2.3 DEVELOPMENT OF MATTE SURFACE ON ROLLER.

Rollers cleaned with acid ammonium chloride for remove dust & impurities.

Rollers grinded on cylindrical grinding machine in 20micron of out side surface.

Rollers polished for creating a smooth and shiny surface by rubbing.

Chromium plating process on rollers for High corrosion resistance & High hardness of it.

Mechanical wheel Blasting process on rollers for creating bright matte surface finish on its surface.

2.4 PROCESSING METHOD

Co-extrusion is the process of pressing two or more materials through the same die to produce a single piece. When multiple plastics are combined, the result can yield properties distinct from those of a single material. Co-extrusion has opened up new frontiers in material engineering and addressed several previously difficult manufacturing needs.

In standard extrusion, solid plastic pellets are gravity fed into a forming mechanism, where jacketed compression screws melt and feed the materials into a die. By contrast, co-extrusion involves multiple extruders forming layered or encapsulated parts. Sometimes five or more materials are used in a single cycle, with each extruder delivering the precise amount of molten plastic needed for the operation..

3 TEST RESULT AND DISCUSSION

3.1 VACUUM LEAKAGE TEST:-

In this type of test generally 55% spirit and 45% water is used. These are mixed together in one beaker. And also 0.1% methylene blue dye and 1% tipol added together the

previous making solutions. This solution mixed properly and then filled in to the 10 glass bottles. And which liners or cap seals are testing that are putted or fitted in aluminum caps. After then with the help of sealing machine the aluminum caps are sealed on the solution filled bottles. The sealing glass bottles are covered with bloating papers with rubber band. Here in this type of test vacuum desiccators used. All bottles are put in vacuum desiccation in horizontal position. Through nipple it is connected with vacuum pump. And vacuum is created at 600 mm Hg till 10 minutes. After then vacuum pump is stopped and checked vacuum desiccators bottles bloating papers on cap whether any bottle leakage found or not. But in matte surface cap seals there are not found any leakages.

3.2 OVEN LEAKAGE TEST:-

In this type of test generally 30% sugar and 70% water is used. These are mixed together in one beaker. This solution mixed properly and then filled in to the 10 glass bottles. And which liners or cap seals are testing that are putted or fitted in aluminum caps. After then with the help of sealing machine the aluminum caps are sealed on the solution filled bottles. The sealing glass bottles are covered with bloating papers with rubber band. Here in this type of test air circulating oven is used. Before this test vacuum leakage test is done. And it is passed in that test then this solution made glass bottles are putted in air circulating oven. These bottles are kept in it for 72 hrs at 50 degree Celsius. After 72 hrs all bottles bloating papers on cap are checked whether any bottle leakage found or not. But in matte surface cap seals there are not found any leakages.

3.3 OPEN CELL DETERMINATION:-

Generally in this type of testing Methylene blue dye and ethylene shalsole are mixed together in one beaker. It is mixed properly and made solution. And then which liners or cap seals are testing that is put in to this solution for 24hrs & and after then 24hrs this cap seals or liners are checked visually whether methylene blue dye come on the surface of liners. But in matte surface cap seals there are not found of methylene blue dye on the surface of liners or cap seals.

3.4 STAINING TEST:-

Generally this type of test is used for dry products which used in pharmaceutical and cosmetic applications. In this type of testing all glass bottles are filled with normal quantity of ampicilline powders. And which liners or cap seals are testing that are putted or fitted in aluminum caps. After then with the help of sealing machine the aluminum caps are sealed on the bottles. These bottles are put upside down position for 50 to 72 hrs & after then checked ampicilline staining on liners or cap seals whether it come or not. But in matte surface cap seals there are not found of ampicilline staining on the surface of liners or cap seals.

3.5 SHAKER TEST:-

Generally in this type of testing the solution is filled in glass bottles. And which liners or cap seals are tested these are putted or fitted in aluminum caps. And with the help of sealing machine that aluminum caps are sealed over the glass bottles. Here in this type of test one shaker machine is used. This shaker machine has four jaws. And solution filled bottles are covered with bloating papers with help of rubber band on the caps. After then these bottles are clamped in shaker machine jaws. After properly clamped this glass bottles are shake at higher speed of the machine for 5 to 10 minutes. After then these bottles are

removed from the jaws and checked the bloating papers on the bottles cap whether any bottles found any leakages or not. In matte surface finish cap seals or liners there is not found any leakages.

3.6 COEFFICIENT OF FRICTION TEST:-

The testing method is ASTM D-1894. The coefficient of friction test fixture consists of a horizontal table and a moveable sled. Both the table and sled are covered with the test material. A tow line attaches to the sled and a low force load cell with a pulley guiding the tow line during the test. The fixture is mounted to the base of the instrument and, as the crosshead/ load cell moves, the sled is pulled across the horizontal table.

Data is recorded from the load cell during the test and analyzed to determine both static and kinetic friction. The static friction is derived from the first maximum peak (force) on the load curve and kinetic friction is derived from the average force between two predefined points. The coefficient of friction is defined as the recorded force divided by the weight of the sled. The COF of EPE sheet is 0.10 static and 0.03 kinetic. The friction speed is 0.5m/s & force is 0.012N/mm².

4 RESULT

After done testing there is no leakage found & reduced co-efficient friction & comparison of sheet the cost of materials such as additive and slip agent reduced. Before per day total 48 batches made in one machine in co-extruder of 25kg where slip agent 0.550kg used per batch so total 0.550kg X 48batch=26.400kg used and antiblock agent 0.150kg used per batch so total 0.150kg X 48batch=7.200kg used. The cost of slip agent is 170rs.per kg so 26.400kg X 170rs. =4488rs.and the cost of antiblock agent is 160rs.per kg so 7.200kg X 170rs. =1152rs. And total cost of materials 4488+1152=5640rs.So, that cost is reduced.

5 CONCLUSION

The Expanded polyethylene cap seals or liners are using since long time in different applications. There is some problem such as materials using cost and also stickiness found in product or sheet. After studying and working on its operations and materials, the solution has been found to overcome its limitations. By using replacing matte surface rollers with polish rollers, the problems can be eliminated and the same outcome can be obtained in product or sheet. So the use of matte finishes rollers the process become economical, the cost of materials such as Antiblock agent 7.2kg per day & cost is 170rs. Per kg and Slip agent 26.4kg per day & cost is 160rs. Per kg so total cost 5640rs.saved, reduce stickiness between cap seals and increased 3kg output per hour as increased 1 r.p.m.

6 CONCLUSION

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