IMPROVEMENT OF COOLING SYSTEM DEVICES IN POLYETHYLENE PRODUCTION LINE

B.M.Abdullaev
Karshi state technical university
Email: bakhtishod.abdullaev@gmail.com
Sh.N. Tursunova
Karshi state technical university
Email: tursunova0314@gmail.com

Abstract: The catalyst complex was prepared by mixing solutions of diethylaluminum chloride and titanium tetrachloride in gasoline at 25-50°C from the meters (1) and (2) in the 3rd mixer. In order to increase the resistance to atmospheric influences and thermal oxidation, various stabilizers-antioxidants were added to the polymer composition. The reactor tubes were of variable diameter (50-75 mm). Identical sections of the tubes were connected using massive hollow plates called retubrents or kalachs. In order to quickly cool the granules, the granulating mold was cooled with demineralized water.

Keywords: Polyethylene, regeneration, granulating machines, polymerization reactors, fluidized polyethylene, Ziegler-Natta catalysts, ethylene peroxide or hydroperoxides.

Annotatsiya: Katalizator kompleksi 25-50°C da (1) va (2) o‘lchagichlardan uzatilayotgan dietilalyuminiyxlorid bilan tetraxlor titanni benzindagi eritmalarini 3chi aralashtirgichda aralashtirib olindi. Atmosfera ta’siriga xamda issiqlikda oksidlanishga chidamliligini oshirish maqsadida polimer tarkibiga turli xil stabilizator-antioksidantlar qo‘shildi. Reaktor quvurlari o‘zgaruvchan diametrli bo‘ladi (50-75 mm). Quvurlarning bir xil bo‘limlari retubrent yoki kalach deb nomlanuvchi massiv ichi bo‘sh plitalar yordamida biriktirildi. Granulalarni tez sovitish maqsadida granulalovchi shakl tuzsizlantirilgan suv bilan sovitildi.

Kalit so‘zlar: Polietilen, regeneratsiya, granulalovchi dastgohlar, polimerlovchi reaktorlar, suyuqlantirilgan polietilen, Tsigler-Natta katalizatorlar, etilenni peroksid yoki gidroperoksidlari.

Аннотация: Каталитический комплекс готовили путем смешивания растворов диэтилалюминия хлорида и тетрахлорида титана в бензине при температуре 25–50 °C из дозаторов (1) и (2) в третьем смесителе. Для повышения атмосферостойкости и термоокислительной стойкости в полимерную композицию добавляли различные стабилизаторы-антиоксиданты. Реакторные трубки имели переменный диаметр (50–75 мм). Одинаковые секции трубок соединяли массивными полыми пластинами –

ISSN 3030-3907

ретрубами или калачами. Для быстрого охлаждения гранул грануляционную форму охлаждали деминерализованной водой.

Ключевые слова: Полиэтилен, регенерация, грануляторы, реакторы полимеризации, псевдоожиженный полиэтилен, катализаторы Циглера-Натта, пероксид или гидропероксиды этилена.

Introduction

In industry, high-pressure polyethylene (HPPE) is polymerized from ethylene in a condensed gas phase at 200-280°C under a pressure of 150-300 MPa in the presence of radical polymerization initiators. In industry, two types of reactors are used to produce HPPE, differing in their design. One of these is a tubular apparatus operating on the principle of ideal compression, and the other is an autoclave with a mixer operating on the principle of mixing, similar to a vertical cylinder apparatus with a mixer. Tubular polymerization reactors used in industry consist of heat exchangers of the pipe type connected in series inside the pipe. The reactor pipes have a variable diameter (50-75 mm). Identical sections of the pipes are connected using massive hollow plates called retubrents or calaches. The pipes and calaches are surrounded by a shell connected in series with each other. Superheated water with a temperature of 190-230°C is used as a heat carrier to remove excess heat from the reaction medium. This superheated water is fed into the tubular reactor shell from the opposite side of the reaction mass to the ethylene feed. The high-pressure superheated water is used to prevent the formation of a polymer film on the tube walls.

Figure 1 shows a general scheme for continuous production of high-pressure polyethylene in a tubular reactor.

ISSN 3030-3907

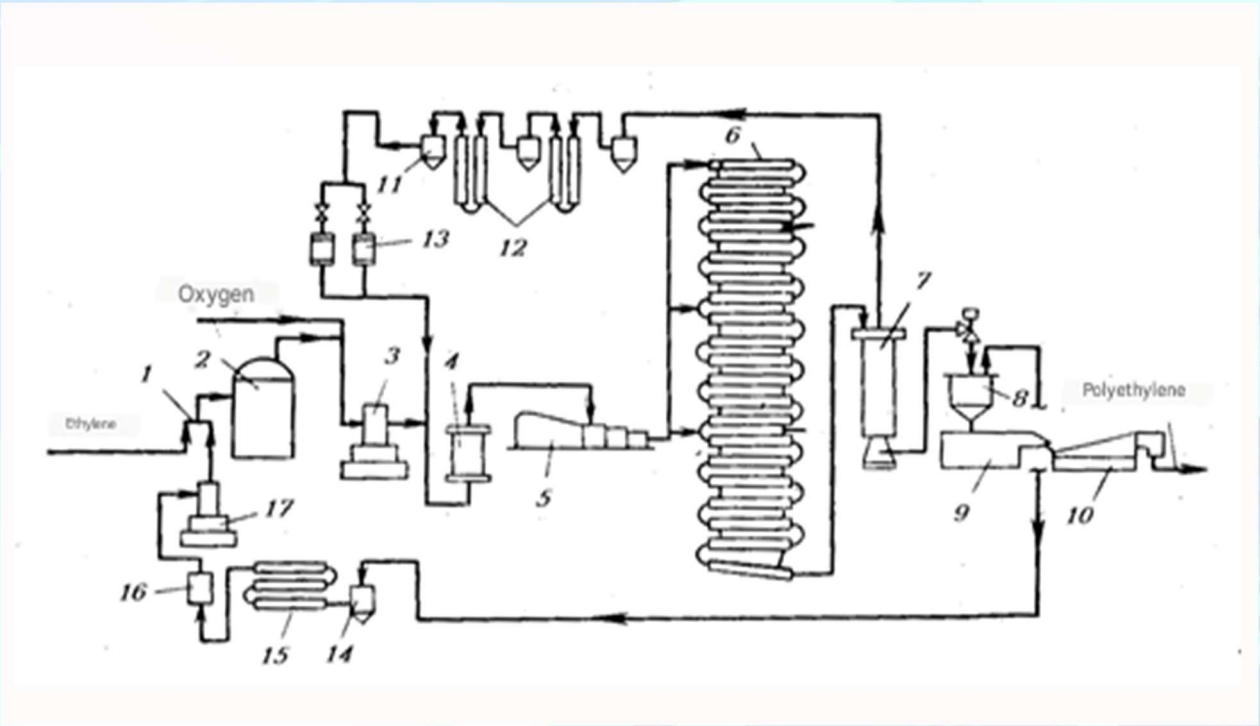


Fig.1 Schematic of the gas phase high-pressure polyethylene production process: 1-collector; 2-low-pressure ethylene mixer; 3-first cascade compressor; 4-high-pressure ethylene mixer; 5-second cascade compressor; 6-pipe reactor; 7-high-pressure separator; 8-low-pressure separator; 9-granulator; 10-vibrating screen; 11,14-cyclone separators; 12,15-coolers; 13,16-filters; 17-primary compression compressor

EXPERIMENTAL RESULTS AND THEIR DISCUSSION

The polymerization reactor consists of three sections, each section is equipped with heat exchangers to heat the gas and reaction mixture to 120-190°C, depending on the type of initiator used. At the end of the third section, a cooler is installed, in which the reaction mass is cooled to 200-250°C.

Fresh ethylene from the gas separation section enters the collector (1) under a pressure of 0.8-1.1 MPa and then into the mixer (2). Here it is mixed with low-pressure reflux ethylene. Oxygen is added to this mixture and fed to a three-stage compressor in the first cascade, where it is compressed to a pressure of 25 MPa. After compression in each stage, ethylene is cooled in coolers, separated from the oil in separators, and then fed into the mixer (4). Here it is mixed with high-pressure reflux ethylene coming from the separator (7). The mixture was then transferred to a two-stage compressor (5) in the second cascade, where it was compressed to a pressure of 245 MPa. The first compressed ethylene was cooled in coolers and cleaned of impurities in separators, and after compression in the second stage (stage), it was transferred to three sections of a tubular reactor (6) for polymerization at 70°C (without cooling). The polymerization reactor consists of

ISSN 3030-3907

three compartments, each compartment is equipped with heat exchangers to heat the gas and reaction mixture to 120-190°C, depending on the type of initiator used. At the end of the third compartment, a cooler is installed, in which the reaction mass is cooled to 200-250°C. The polymerization of ethylene in a tubular reactor was carried out under the following conditions.

Temperature, oC	190-200
Pressure, Mpa	245
Oxygen concentration,%	0.002-0.008
The rate of conversion of ethylene into polymer in one cycle (rotation), %	26-30
The overall rate of conversion of ethylene to polymer,%	95-98

From the tubular reactor (6), unreacted ethylene mixed with the polymer is fed through a reducing valve to a high-pressure separator (7) at a pressure of 24.5-26.3 MPa. Here, ethylene and polyethylene are separated from each other. Unreacted ethylene is directed from the top of the separator to cyclone separators and coolers (12). Here, the polyethylene carried away with ethylene is separated. Then the ethylene is cooled and returned to the mixer (4) for mixing with new ethylene and from there to the cycle.

CONCLUSION

Low-pressure polyethylene (LP) was obtained by this method by polymerizing ethylene at a pressure of 0.3-0.5 MPa, at 70-80°C, in the presence of organic solvents (gasoline, etc.). The polymerization was carried out in the presence of Ziegler-Natta catalysts (diethylaluminum chloride and titanium tetrachloride). The ratio of alkylaluminum to titanium tetrachloride was taken from 1:1 to 1:2. Since this catalyst complex decomposes under the influence of oxygen and moisture in the air, the polymerization was carried out in the presence of a dehydrated solution and in a nitrogen atmosphere. Identical sections of the pipes were connected using massive hollow plates, known as retubrents or kalachs. In order to quickly cool the granules, the granulating mold was cooled with demineralized water.

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ISSN 3030-3907