



## ABSTRAK

Polivinil asetat (PVAc) merupakan salah satu polimer sintetik yang banyak digunakan dalam industri perekat, pelapis, dan bahan bangunan karena sifat adhesifnya yang baik dan kestabilan kimianya. Prarancangan pabrik polivinil asetat memerlukan bahan baku utama asam asetat dan etilen untuk memproduksi vinil asetat monomer (VAM) yang kemudian akan melalui proses polimerisasi emulsi. Pabrik direncanakan memiliki kapasitas produksi sebesar 25.000 ton/tahun dan berlokasi di kawasan industri Cilegon, dengan pertimbangan ketersediaan bahan baku, infrastruktur, dan potensi bencana.

Proses produksi terdiri dari beberapa tahap utama, yaitu sintesis vinil asetat dari asam asetat dan etilen, pemurnian vinil asetat, dan proses polimerisasi emulsi untuk menghasilkan polivinil asetat. Reaksi utama berlangsung pada kondisi suhu  $50^{\circ}\text{C}$  dan tekanan 1 atm dalam reaktor *semi-batch* dengan inisiasi radikal bebas menggunakan inisiator potasium persulfat.

Pabrik polivinil asetat beroperasi secara kontinyu selama 330 hari per tahun dengan waktu operasi 24 jam per hari. Proses persiapan bahan baku menggunakan reagen utama berupa  $\text{CH}_2\text{CH}_2$  99,95% sebanyak 65.309 ton/tahun,  $\text{CH}_3\text{COOH}$  99,8% sebanyak 26.727,3230 ton/tahun, VAM sebanyak 12.525 ton/tahun dan bahan pengemulsi seperti polivinil alkohol sebanyak 1.318 ton/tahun. Penunjang proses meliputi kebutuhan air *make-up* sebesar 7.161,35  $\text{m}^3$ /hari, listrik 32,47 MW, dan air pendingin sebesar 100,10  $\text{m}^3$ /jam.

Pabrik dirancang dengan estimasi kebutuhan *fixed capital* sebesar US\$ 39.941.432,07 dan Rp109.232.742.253,33 dengan luas tanah sebesar 20.000  $\text{m}^2$  serta *working capital* sebesar US\$ 4.512.427,28 dan Rp7.375.735.079,70. Hasil analisis ekonomi menunjukkan profit bersih sebesar US\$ 11.972.314,15 dengan ROI setelah pajak sebesar 28,79% dan *Pay Out Time* selama 2,65 tahun. Selain itu, nilai *Break Even Point* tercatat sebesar 55,58%, *Shut Down Point* sebesar 24,12%, dan DCFRR sebesar 32,06%.

**Kata kunci:** Polivinil asetat, vinil asetat, polimerisasi emulsi, kelayakan ekonomi



## ABSTRACT

*Polyvinyl acetate (PVAc) is a synthetic polymer widely used in the adhesive, coating, and construction industries due to its excellent adhesive properties and chemical stability. This preliminary plant design focuses on the production of PVAc using acetic acid and vinyl acetate monomer (VAM) as the main raw materials through an emulsion polymerization process. The plant is designed with a production capacity of 25,000 tons per year and is planned to be located in the Banten industrial area, East Java, considering the availability of raw materials, supporting infrastructure, and low disaster risk.*

*The production process consists of several key stages, including the synthesis of vinyl acetate from acetic acid and ethylene, purification of vinyl acetate, and emulsion polymerization to produce polyvinyl acetate. The main polymerization reaction is carried out at 50°C and 1 atm in a batch reactor with free radical initiation using initiators such as potassium persulfate.*

*The main raw materials required are ethylene ( $\text{CH}_2=\text{CH}_2$ , 99.93%) at 65,309 tons/year, acetic acid ( $\text{CH}_3\text{COOH}$ , 99.8%) at 26,727.32 tons/year, and VAM at 12,525 tons/year, along with polyvinyl alcohol as the emulsifier at 1,318 tons/year. Supporting utilities include make-up water of 7,161.35  $\text{m}^3/\text{day}$ , electrical energy of 32.47 MW, and cooling water of 100.1  $\text{m}^3/\text{hour}$ . The plant is designed to operate continuously for 330 days per year, 24 hours per day.*

*The estimated fixed capital investment is US\$ 39,941,432.07 and Rp109,232,742,253.33, occupying a land area of 20.000  $\text{m}^2$ , the working capital is US\$ 4,512,427.28 and Rp7,375,735,079.70 per year. Economic analysis shows a net profit of US\$ 11.972.314,15 per year, a post-tax ROI of 28,79%, and a Pay Out Time (POT) of 2,65 years. The Break Even Point (BEP) is calculated at 55,58%, the Shut Down Point (SDP) at 24,12%, and the Discounted Cash Flow Rate of Return (DCFRR) at 32,06%.*

**Keywords:** *polyvinyl acetate, vinyl acetate monomer, emulsion polymerization, economic feasibility*