

BAB XII

DISKUSI DAN KESIMPULAN

XII.1 Diskusi

Karbon aktif merupakan material karbon yang memiliki kemampuan adsorpsi karena sifat-sifat fisika dan kimianya. Berkat kemampuan adsorpsinya, karbon aktif memiliki aplikasi di berbagai industri. Pendirian pabrik karbon aktif dengan bahan baku TKKS, diharapkan mampu memenuhi kebutuhan pasar karbon aktif di Indonesia dan mengurangi nilai impor, serta membantu mengurangi limbah TKKS di Indonesia.

Kelayakan pendirian pabrik karbon aktif berbahan baku TKKS, dapat ditinjau dari beberapa segi yang diuraikan sebagai berikut:

- Segi bahan baku

Bahan baku yang digunakan yaitu tandan kosong kelapa sawit (TKKS) karena ketersediaan TKKS sangat melimpah di Indonesia, mengingat Indonesia adalah penghasil minyak kelapa sawit terbesar di dunia. Keberlimpahan jumlah limbah TKKS juga dapat diamati dari peningkatan jumlah perkebunan kelapa sawit di Indonesia setiap tahunnya. Selain itu dengan menggunakan limbah TKKS sebagai bahan baku turut membantu mengurangi limbah TKKS yang belum dimanfaatkan secara optimal.

- Segi proses dan produk yang dihasilkan

Secara singkat, proses pembuatan karbon aktif di pabrik ini terbagi menjadi empat tahap besar, yakni *pretreatment* bahan baku TKKS, karbonisasi TKKS, aktivasi *charcoal*, dan *post-treatment charcoal*. Dari keempat tahap tersebut, tahap ketiga (karbonisasi) dan tahap keempat (aktivasi) menentukan *yield* karbon aktif yang dihasilkan, yang mana *yield* karbon aktif pabrik ini adalah 28,3516%. Selain menghasilkan karbon aktif, pabrik ini juga menghasilkan produk samping yang *valuable*, seperti larutan HCl 40%.

Pada pabrik ini dihasilkan karbon aktif dengan sifat magnetik yang cocok dipakai sebagai adsorben terutama bagi pabrik-pabrik. Karbon aktif yang dihasilkan mempunyai nilai kadar air sebesar 0,89%, kadar abu 4,44%, serta kadar besi sebesar 3,77%. Selain itu, suhu karbonisasi dan aktivasi juga merupakan suhu

yang optimal bagi sifat-sifat karbon aktif, seperti total volume pori $0,45 \text{ cm}^3/\text{g}$ dan luas permukaan $500 \text{ m}^2/\text{g}$.

- Segi lokasi

Pabrik karbon aktif ini direncanakan dibangun di Kelurahan Mengkapan, Kecamatan Sungai Apit, Kabupaten Siak, Provinsi Riau. Provinsi Riau dipilih karena merupakan provinsi penghasil TKKS terbesar di Indonesia dan jarak lokasi pabrik dengan salah satu sumber bahan baku tidak jauh. Selain itu adanya akses transportasi, pelabuhan Tanjung Buton sebagai tempat penerimaan dan pengiriman barang, dan sungai Mengkapan sebagai sumber air yang tidak jauh dari lokasi pabrik, serta area yang sangat memungkinkan untuk dilakukan perluasan pabrik. Sehingga dapat dikatakan lokasi didirikannya pabrik karbon aktif ini sangat strategis.

- Segi ekonomi

Kelayakan pabrik karbon aktif dari segi ekonomi ditinjau berdasarkan pada analisa ekonomi. Hasil analisa ekonomi tersebut menunjukkan:

- Laju pengembalian modal atau *Return on Investment* (ROI) sesudah pajak diatas bunga bank, yaitu 17,71%;
- Laju pengembalian ekuitas atau *Return on Equity* (ROE) sesudah pajak, yaitu 48,55%;
- Waktu pengembalian modal atau Pay Out Time (POT) sesudah pajak, yaitu selama 4 tahun 2 bulan;
- Titik impas atau *Break Even Point* (BEP), yaitu 44,58%.

Berdasarkan hasil analisa tersebut, dapat diambil kesimpulan bahwa prarencana pabrik karbon aktif berbahan Baku TKKS ini layak untuk dilanjutkan ke tahap perencanaan, baik dari segi teknis maupun ekonomis.

XII.2 Kesimpulan

Pabrik	: Karbon aktif
Kapasitas	: 12.000 ton/tahun
Lokasi pabrik	: Kelurahan Mengkapan, Kecamatan Sungai Apit, Kabupaten Siak, Provinsi Riau
Bahan baku	: Tandan Kosong Kelapa Sawit
Sistem operasi	: Semikontinyu

Jumlah tenaga kerja : 115 orang

Utilitas

1. Air :

- Air sanitasi = $3,63 \text{ m}^3/\text{hari}$
- Air pendingin = $5.846,9979 \text{ m}^3/\text{hari}$
- Air proses = $288,3488 \text{ m}^3/\text{hari}$

2. Udara panas (150°C) = 838.632 kg/hari

3. Listrik = $598,76 \text{ kW/hari}$

4. Bahan bakar :

IDO = $1,6927 \text{ m}^3/\text{hari}$ = $10,1564 \text{ m}^3/\text{tahun}$ (generator);

TKKS = $7.472,4 \text{ kg/hari}$ = $2.465,892 \text{ kg/tahun}$

Analisa ekonomi dengan metode *Discounted Cash Flow*:

- *Return on Investment* (ROI) sebelum pajak = 24,71%
- *Return on Investment* (ROI) setelah pajak = 17,71%
- *Return on Equity* (ROE) sebelum pajak = 65,98%
- *Return on Equity* (ROE) sesudah pajak = 48,55%
- *Pay Out Time* (POT) sebelum pajak = 3,3878
- *Pay Out Time* (POT) sesudah pajak = 4,1667
- *Break Even Point* (BEP) = 44,60%

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