Prarancangan Pabrik Asam Levulinat dari Selulosa dengan Kapasitas 20.000 Ton/Tahun
Navira Amalia Indriani, Prof. Dr. Ir. Aswati Mindaryani, M.Sc., IPU
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

Aryandi, A. (2025). Gaji UMR Ketapang 2025 dan Seluruh Kalbar. https://karangdangin.digitaldesa.id/berita/gaji-umr-ketapang-2025-dan-seluruh-kalbar

Pemerintah Kabupaten Ketapang. (2023). *Profil Daerah Kabupaten Ketapang 2023*. Ketapang: Bappeda Ketapang.

Adhami, W., Richel, A., & Len, C. (2023). A review of recent advances in the production of furfural in batch system. In *Molecular Catalysis* (Vol. 545). Elsevier B.V. https://doi.org/10.1016/j.mcat.2023.113178

Aditya, W., Awaluddin, A., & Saryono. (2014). Studi Produksi Asam Levulinat dari Pati Ubi Gajah (Manihot esculenta) Menggunakan Katalis Asam Sulfat. JOM FMIPA.

American Chemical Society. (2022, 18 April). Diakses pada 4 november 2025, dari https://www.acs.org/molecule-of-the-week/archive/f/formic-acid.html

ANTARA News Kalbar. (2016). Bupati Ketapang Resmikan Pabrik Kelapa Sawit PT KAL. https://kalbar.antaranews.com/berita/345295/bupati-ketapang-resmikan-pabrik-kelapa-sawit-pt-kal

Aries, R.S. and Newton, R.D. (1955) Chemical Engineering Cost Estimation by Robert S. Aries and Robert D. Newton. New York: McGraw-Hill.

Badan Geologi, Kementerian Energi dan Sumber Daya Mineral (ESDM). (2024). *Peta Sumber dan Bahaya Gempa Indonesia Tahun 2024*. Bandung: PVMBG.

Badan Meteorologi, Klimatologi, dan Geofisika (BMKG). (2024). *Data Iklim Kabupaten Ketapang Tahun 2024*. Pontianak: Stasiun Meteorologi Ketapang.

Bailey, M. (2015, July 20). *GFBiochemicals starts up world's first commercial-scale plant for bio-based levulinic acid.* Chemical Engineering. Retrieved from https://www.chemengonline.com/gfbiochemicals-starts-worlds-first-commercial-scale-plant-bio-based-levulinic-acid/?printmode=1&utm Chemical Engineering

Bismarck, A., Mishra, S., & Lampke, T. (2005). *Plant Fibers as Reinforcement for Green Composites*. CRC Press. https://doi.org/10.1201/9780203508206.ch2

Prarancangan Pabrik Asam Levulinat dari Selulosa dengan Kapasitas 20.000 Ton/Tahun
Navira Amalia Indriani, Prof. Dr. Ir. Aswati Mindaryani, M.Sc., IPU
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

BNPB. (2024). *Data Risiko Bencana Kabupaten Ketapang, Kalimantan Barat*. Jakarta: Badan Nasional Penanggulangan Bencana.

CameoChemicals. Formic Acid. Diakses pada 4 November 2025, dari https://cameochemicals.noaa.gov/chemical/3513

CameoChemicals. Furfural. Diakses pada 4 November 2025, dari https://cameochemicals.noaa.gov/chemical/3522

Chemical & Engineering News. (2009, 2 Maret) *Segetis readies plant-based chemicals. Chemical & Engineering News.* Diakses pada 5 November 2025, dari https://cen.acs.org/articles/87/i9/Segetis-Readies-Plant-Based-Chemicals.html

Coulson, J.M., Richardson, J.F., Sinnott, R.K. and Towler, G., 1999. *Coulson and Richardson's chemical engineering: Volume 6: Chemical engineering design*. 3rd ed. Oxford: Butterworth-Heinemann.

Delele, M. A., Weigler, F., & Mellmann, J. (2015). Advances in the Application of a Rotary Dryer for Drying of Agricultural Products: A Review. In *Drying Technology* (Vol. 33, Issue 5, pp. 541–558). Bellwether Publishing, Ltd. https://doi.org/10.1080/07373937.2014.958498

Dimawarnita, F., Faramitha, Y., Prakoso, H. T., Puspitasari, I., Kalbuadi, D. N., & Prasetyo, D. (2023). Characterization of cellulose from oil palm empty fruit bunches by fast delignification process with different solvents. *E-Journal Menara Perkebunan*, *91*(2). https://doi.org/10.22302/iribb.jur.mp.v91i2.542

Direktorat Statistik Tanaman Pangan. (2024). *STATISTIK KELAPA SAWIT INDONESIA*.

Farisi, M. C. A., Sulthani, M. B., Dhanutama, K. D., Rizki, L. S., Triningtyas, A. Musipah. (2025). KABUPATEN KETAPANG DALAM ANGKA 2025, Vol. 18, 2025, Hal. 95-95, 332. Badan Pusat Statistik Kabupaten Ketapang.

Gea, S., & Harahap, M. (2018). *SELULOSA: KARAKTERISTIK DAN PEMANFAATANNYA SEBAGAI BIOMATERIAL*. USU Press.

Prarancangan Pabrik Asam Levulinat dari Selulosa dengan Kapasitas 20.000 Ton/Tahun
Navira Amalia Indriani, Prof. Dr. Ir. Aswati Mindaryani, M.Sc., IPU
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Girisuta, B., Janssen, L. P. B. M., & Heeres, H. J. (2006). *Green Chemicals: A Kinetic Study on the Conversion of Glucose to Levulinic Acid*. Chemical Engineering Research and Design, 84(A5), 339-349. (Untuk referensi masalah *humins* dan kondisi operasi).

Grand View Research. (2024). Levulinic Acid Market Size, Share & Trends Analysis Report (2024-2030). https://www.grandviewresearch.com/industry-analysis/levulinic-acid-market

Hafids, S., Fortuna, D., & Wahyuni, A. R. (2018). Effectiveness of the Shredder Machine and Empty Fruit Bunch Press to Reduce Oil Losses from Oil Palm Empty Fruit Bunches. *Jurnal Ilmiah Rekayasa Pertanian Dan Biosistem*, *6*(2), 168.

Hayes, D. J., Ross, J., Hayes, H. B., & Fitzpatrick, S. (n.d.). *The Biofine Process: Production of Levulinic Acid, Furfural and Formic Acid from Lignocellulosic Feedstocks*.

Hidayat, M. S., Hasibuan, A., Harahap, B., & Nasution, S. P. (2022). Pemanfaatan Tandan Kosong Kelapa Sawit Sebagai Bahan Pupuk di PT Karya Hevea Indonesia. *Factory Jurnal Industri, Manajemen Dan Rekayasa Sistem Industri*, *1*(2), 52–58. https://doi.org/10.56211/factory.v1i2.172

Indonesia Palm Oil Strategic Studies. (n.d.). *Mengubah Limbah TKKS Menjadi Solusi Strategis untuk Pertanian dan Energi Berkelanjutan*. IPOSS. Retrieved November 4, 2025, from https://iposs.co.id/mengubah-limbah-tkks-menjadi-solusi-strategis-untuk-pertanian-dan-energi-berkelanjutan/

Isnaini Nawawi, M. S., Mardawati, E., Nur Fitriana, H., Putri Amanda, dan, Ir Soekarno Km, J., Barat, J., Riset Biomassa dan Bioproduk, P., Riset Hayati dan Lingkungan, O., Riset dan Inovasi Nasional Jl Raya Jakarta-Bogor Km, B., & Kunci, K. (2023). *Evaluasi Tahapan Pretreatment dan Hidrolisis Enzimatik terhadap Tadan Kosong Kelapa Sawit untuk Produksi Xilosa dan Glukosa*. *1*(1), 10-11.

Kern, D.Q., 1950. *Process heat transfer*. New York: McGraw-Hill.

Kingda Pump. (2024). *Panduan Pemompaan untuk Pompa Lumpur Industri (Industrial Slurry Pumping Guide).* Diakses pada 7 Desember 2025 dari https://kingdapump.com/id/panduan-pemompaan-untuk-pompa-lumpur-industri/

Prarancangan Pabrik Asam Levulinat dari Selulosa dengan Kapasitas 20.000 Ton/Tahun
Navira Amalia Indriani, Prof. Dr. Ir. Aswati Mindaryani, M.Sc., IPU
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Kontovas, S., Misailidis, N., & Petrides, D. (2022). *Levulinic Acid Production Process Modeling and Evaluation using SuperPro Designer.* Intelligen, Inc.

Kresnawaty, I., Mismana Putra, S., Budiani, A., & Darmono, T. (2017). KONVERSI TANDAN KOSONG KELAPA SAWIT (TKKS) MENJADI ARANG HAYATI DAN ASAP CAIR, Hal. 172.

Kumara, S., Ahluwaliaa, V., Kundua, P., Rajender S. Sangwana, S. K., Runge, T. M., & Elumalaia, S. (2018). Improved levulinic acid production from agri-residue biomass in biphasic solvent system through synergistic catalytic effect of acid and products. *Bioresource Technology 251*, 143-150.

Kwangu.com. *Psychrometric Calculator*. https://www.kwangu.com/work/psychrometric.htm

Mariscal, R., Maireles-Torres, P., Ojeda, M., Sádaba, I., & López Granados, M. (2016). Furfural: A renewable and versatile platform molecule for the synthesis of chemicals and fuels. In *Energy and Environmental Science* (Vol. 9, Issue 4, pp. 1144–1189). Royal Society of Chemistry. https://doi.org/10.1039/c5ee02666k

Maz Day. *Flash Drum*. https://id.scribd.com/document/351133634/*Flash*-Drum

McCabe, W.L., Smith, J.C. and Harriott, P., 2005. *Unit operations of chemical engineering*. 7th ed. New York: McGraw-Hill.

Mordor Intelligence. (2025, 2 Mei) *Levulinic acid market size & share analysis: Growth trends & forecasts (2025–2030).* Diakses 5 November 2025, dari https://www.mordorintelligence.com/industry-reports/levulinic-acid-market

Mujumdar, A. S. (2004). *Handbook of Industrial Drying*.

Mukherjee, R. (1998). *Effectively Design Shell-and-Tube Heat Exchangers*. Chemical Engineering Progress, 94(2), 21-37. (Referensi klasik untuk alokasi fluida).

Multimedika. Furfural. Diakses pada 4 November 2025, dari https://www.multimedika.co.id/products/furfural

Muryanto, Sudiyani, Y., & Abimanyu, H. (2016). "Optimasi Proses Optimasi Proses Perlakuan Awal NaOH Tandan Kosong Kelapa Sawit untuk menjadi Bioetanol. *Terap.Indones*, *18*(1), 27–35. http://kimia.lipi.go.id/inajac/index.php

Prarancangan Pabrik Asam Levulinat dari Selulosa dengan Kapasitas 20.000 Ton/Tahun
Navira Amalia Indriani, Prof. Dr. Ir. Aswati Mindaryani, M.Sc., IPU
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

P&S Intelligence. (2024). Levulinic Acid Market Size & Growth Forecast Report to 2032. https://www.psmarketresearch.com/market-analysis/levulinic-acid-market

Palm Oil Indonesia. (2025, August 14). *Rangkuman Produk Kelapa Sawit Terbaru 2025*. Palmoilina.

Paraschiv, G., Moiceanu, G., Voicu, G., Chitoiu, M., Cardei, P., Dinca, M. N., & Tudor, P. (2021). Optimization issues of a hammer mill working process using statistical modelling. *Sustainability (Switzerland)*, *13*(2), 10.

Pemerintah Kabupaten Ketapang. (2024). Laporan Penyusunan Sinkronisasi Program Pemanfaatan Ruang Kabupaten Ketapang, Hal. II. 30 - II.31. Ketapang: Dinas Pekerjaan Umum dan Tata Ruang.

Pemerintah Provinsi Kalimantan Barat (2025). Keputusan Gubernur Kalimantan Barat Nomor 1355 Tahun 2025 tentang Upah Minimum Kabupaten/Kota di Provinsi Banten Tahun 2026.

Peters, M. S., Timmerhaus, K. D., & West, R. E. (1991). Plant design and economics for chemical engineers (4th ed.). McGraw-Hill.

Petrides, D., Kontovas, S., & Misailidis, N. (2022). *Levulinic Acid Production from Cellulosic Biomass-Process Modeling and Techno-Economic Assessment (TEA) using SuperPro Designer*. https://doi.org/10.13140/RG.2.2.17520.53760

Portal Kalbar. (2021). PT LAP Resmikan Pabrik Pengolahan Buah Sawit, Bupati Optimis Dongkrak Ekononomi. https://portalkalbar.id/pt-lap-resmikan-pabrik-pengolahan-buah-sawit-bupati-optimis-dongkrak-ekononomi/

PubChem. (2025, 27 September). 5-Hydroxylmethyl Furfural. Diakses pada 4 November 2025, dari https://pubchem.ncbi.nlm.nih.gov/compound/5-_Hydroxymethyl_furfural

PubChem. (2025, 27 September). Formic Acid. Diakses pada 4 November 2025, dari https://www.acs.org/molecule-of-the-week/archive/f/formic-acid.html

PubChem. (2025, 27 September). Levulinic Acid. Diakses pada 4 November 2025, dari https://pubchem.ncbi.nlm.nih.gov/compound/Levulinic-Acid

Prarancangan Pabrik Asam Levulinat dari Selulosa dengan Kapasitas 20.000 Ton/Tahun
Navira Amalia Indriani, Prof. Dr. Ir. Aswati Mindaryani, M.Sc., IPU
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

PubChem. (2025, 27 September). Sulfuric Acid. Diakses pada 4 November 2025, dari https://pubchem.ncbi.nlm.nih.gov/compound/Sulfuric-Acid

Pulidindi, I. N., & Kim, T. H. (2018). Conversion of levulinic acid from various herbaceous biomass species using hydrochloric acid and effects of particle size and delignification. *Energies*, *11*(3). https://doi.org/10.3390/en11030621

Putra, H. P., & Yuriandala, Y. (2012). *PRODUK RAMAH LINGKUNGAN DARI TANDAN KOSONG KELAPA SAWIT*.

Rackemann, D. W., & Doherty, W. O. (2011). The conversion of lignocellulosics to levulinic acid. In *Biofuels, Bioproducts and Biorefining* (Vol. 5, Issue 2, pp. 198–214). https://doi.org/10.1002/bbb.267

Rahman, D. A., Harahap, A. F. P., & Gozan, M. (2022). Techno-economic evaluation of integrated levulinic acid, formic acid, and furfural plant from oil palm empty fruit bunch with pre-treatment variations. Menara Perkebunan,90(1),51–60. https://mp.iribb.org/index.php/mpjurnal/article/view/485

Rahmi, H. Y., Kusumastuti, Y., & Hidayat, M. (2024). *Isolasi Selulosa dari Tandan Kosong Kelapa Sawit Menggunakan Deep Euctetic Solvent (DES) Berbasis Kolin Klorid dan Asam Laktat*.

Renewable Carbon. (2017). Bio-On and Sadam Group project launches for sustainable low-cost production of levulinic acid for the green chemical industry. Renewable Carbon. Retrieved November 5, 2025, from https://renewable-carbon.eu/news/bio-on-and-sadam-group-project-launches-for-sustainable-low-cost-production-of-levulinic-acid-for-the-green-chemical-industry/

Retsch. (n.d.). *Hammer Mill HM 200*. Retrieved from Retsch.com: https://www.retsch.com/products/milling/rotor-mills/hm-200/?utm_term=hammer%20mill%20laboratory&utm_campaign=RETSCH+-+EN+-+Asien+-+%5BVV%5D+-+%5BBBREV!%5D&utm_source=adwords&utm_medium=ppc&hsa_acc=8221357699&hsa_cam=22698266785&hsa_grp=180581225745&hsa_ad

Prarancangan Pabrik Asam Levulinat dari Selulosa dengan Kapasitas 20.000 Ton/Tahun
Navira Amalia Indriani, Prof. Dr. Ir. Aswati Mindaryani, M.Sc., IPU
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

SchuF Control Valves**.** *Control Valves*. Diakses pada 7 Desember 2025 dari https://schuf.de/control-valves/?utm_source=chatgpt.com

Serth, R. W., & Lestina, T. (2014). *Process Heat Transfer: Principles, Applications and Rules of Thumb* (2nd Ed.). Academic Press. (Bab: Shell and Tube Design).

Setyawan, A., Hendro, H., & Purwanta, P. (2021). *Mekanisme kerja mesin shredder dan analisis kegagalan pada operasi proses pengolahan limbah radioaktif padat material terkontaminasi*. *Reaktor: Buletin Pengelolaan Reaktor Nuklir, 18*(1), 1. https://doi.org/10.17146/bprn.2021.18.1.6301

Shen, J., & Wyman, C. E. (2012). Hydrochloric acid-catalyzed levulinic acid formation from cellulose: Data and kinetic model to maximize yields. *AIChE Journal*, *58*(1), 236–246. https://doi.org/10.1002/aic.12556

Smith, J.M., Van Ness, H.C. and Abbott, M.M., 2005. *Introduction to chemical engineering thermodynamics*. 7th ed. New York: McGraw-Hill.

Towler, G., & Sinnott, R. (2013). *Chemical Engineering Design: Principles, Practice and Economics of Plant and Process Design*. Butterworth-Heinemann. (Bab: Heat Transfer Equipment).

Ulrich, G. D. (1984). A Guide to Chemical Engineering Process Design and Economics. New York: John Willey & Son.

USDA Foreign Agricultural Service. (2025). *Production - Palm Oil*. U.S. Department of Agriculture. https://www.fas.usda.gov/data/production/commodity/4243000

Victor, A., Pulidindi, I. N., & Gedanken, A. (2014). Levulinic acid production from Cicer arietinum, cotton, Pinus radiata and sugarcane bagasse. *RSC Advances*, *4*(84), 44706–44711. https://doi.org/10.1039/c4ra06246a

Walas, S.M., 1990. *Chemical process equipment: Selection and design*. Boston: Butterworth-Heinemann.

Weingarten, R., Conner, W. C., & Huber, G. W. (2012). Production of levulinic acid from cellulose by hydrothermal decomposition combined with aqueous phase dehydration