

CEP Example Captions

These are examples of good, descriptive captions that tell a story. This is what the author provided, before editing, but only minimal editing was needed.

Figure 1. The main steps in the production of lignocellulosic biofuel are material handling, pretreatment and liquid/solid separation, hydrolysis and liquefaction, fermentation, and product recovery via distillation and evaporation.

Figure 2. This plant in Valdivia Chile operates two parallel lines log debarking 6600 tons per day.

Figure 3. The world's largest wood processing facility, located in China, operates 4 lines of wood chippers similar to the one pictured here for a total production of 11,300 tons per day.

Figure 4. Outside feedstock storage and reclaim for the world's largest wood processing facility is open to weather, biodegradation and contamination.

Figure 5. The world's largest chip screening facility located in China, screens for oversize, undersize and overthick at a rate of 11,300 tons per day.

Figure 6. Truck dumpers efficiently unload complete trailers of high density feedstock in a few minutes.

Figure 7. This horizontal feed multi-purpose hog crushes stumps, trimmings and demolition waste for a biomass boiler.

Figure 8. Miscanthus grass can grow up to 13 feet tall and is harvested and baled similar to conventional straw. Photos courtesy of Steven Long, Univ. of Illinois.

Figure 9. Switchgrass is another annual crop being studied as a feedstock for biofuel. Photos courtesy of Steve Flick, ShowMe Energy Cooperative.

Figure 10. Bagasse feedstock is stored in huge piles for a commercial fiberboard plant in India.

Figure 11. The discharge of a bagasse reclaim bin in India uses a rake conveyor to insure the low density feedstock doesn't bridge.

Figure 12. Storage bins for low density feedstocks use moving floors and low height to width ratios.

Figure 13. This doffing roll discharge works together with the moving floor to meter low density feedstock from storage.

Figure 14. This modular screw device (MSD) installed in Brazil, resizes 700 tons per day of feedstock as it forms discharge pressure plug.

Figure 15. This plug screw feeder in Germany is almost 1 meter in diameter and processes 1550 tons per day of feedstock.

Figure 16. A rotary valve in Brazil operates at 700 TPD to form a pressure plug with no change to the feedstock size or moisture.

Figure 17. A single-stage pre-treatment process has one reaction step that may be followed by washing.

Figure 18. Vertical reactors are more economical for large production rates. This wood chip reactor in Brazil operates at 6000 tons per day.

Figure 19. Reactors may be simple plug flow devices or contain multiple injection and extraction capabilities like this 6000 TPD pressurized reactor in Uruguay.

Figure 20. Horizontal reactors work well for lower production or more precise reaction conditions.

Figure 21. The discharge screw from a horizontal reactor works well for higher consistencies as the screw wipes the orifice of the steam explosion discharge with every passing flight.

Figure 22. The scraper bottom discharge is selected for diluted or lower consistency reactor discharge. The inset shows how the scraper arm moves material to the center where differential pressure releases it through a valve and blowline.

Figure 23. This high consistency reactor discharge uses a concentric geometric design with no moving parts to minimize compression forces on the material.

Figure 24. The same concentric geometric design shown here on a chip bin prevents bridging to result in uniform material flow.

Figure 25. This horizontal reactor with discharge screw is designed for steam explosion with a differential pressure of 10 to 20 Bar.

Figure 26. Hydrolyzed wood material is fibrous with 10 to 30 mm fiber bundles before steam explosion and opened to 1-2 mm particles with expanded volume and huge surface area after.

Figure 27. Two-stage pre-treatment process requires more equipment but results in higher yields and better separations of C5 and C6 sugars.

Figure 28. Screw presses operate effectively for free draining fibrous feedstock and have the advantage of continuous, closed (sterile) operation.

Figure 29. Belt filter presses have many versatile designs for free draining materials but the open design is difficult to keep sterile.

Figure 30. Filter presses can dewater any of the low drainage materials but are batch operation and require significant machine area.

Figure 31. The closed, compact designed centrifuges are used in many ethanol plants today to separate whole stillage from the corn and wheat slurries.