

Spent Hops (Trub)

DESCRIPTION

Hops are added to malt extract, which is then boiled to release the hops' oils and resins. The extract is then clarified and filtered, leaving spent hops, or trub. Spent hops represent a small fraction of a brewery's [spent grains](#), and are sometimes mixed with them and sold to farmers as a livestock feed called brewers grains.

CLASSIFICATION

[Plant-based proteins](#), [Lignocellulose](#)

SOURCE INDUSTRY

[Breweries](#)

ANNUAL VOLUME GENERATED IN WISCONSIN

24,500 barrels (based on 8.57 million barrels beer¹ at an estimated 1 barrel trub/350 barrels beer²)

CURRENT APPLICATIONS

Fertilizer/mulch, animal consumption (feed supplement)

COST

No cost or marginal revenue if added to brewers grains or given away; otherwise, standard disposal costs

APPLICABLE BIOREFINING PROCESSES

[Anaerobic digestion](#), [biomass gasification](#), [combustion](#), [fast pyrolysis](#), [fermentation of lignocellulosic biomass](#), [thermochemical liquefaction](#)

REFERENCES

¹ Ivey, Mike. 2004. "State says Cheers! Wisconsin brewers buck trend." The Capital Times, March 25. Madison, WI. www.madison.com/captimes/business/stories/70895.php (15 April 2004)

² Olson, Gary. Plant manager, Huber Brewing Company. Interviewed by Sean Weitner. Telephone, 16 April 2004.

Animal Feed Resources Information System. Spent hops. www.fao.org/ag/aga/agap/frg/afris/Data/469.HTM (15 April 2004).

Ingredients 101. Brewers grains, dried. www.ingredients101.com/brsgrnd.htm (15 April 2004).