Borregaard

TECHNICAL DATA SHEET

ETHANOL ABSOLUTE TECHNICAL

Ethanol from Borregaard is produced on cellulosic waste and is therefor classified as an environmentally friendly bioethanol. Our product has a very high quality and purity.

Product name and synonyms: Ethanol, Bioethanol,

second generation ethanol, advanced ethanol

CAS No: 64-17-5

EC No: 200-578-6

REACH Reg. No.: 01-2119457610-43

Formula:C_2H_5OH

PRODUCTION PROCESS DESCRIPTION

The raw material is the sugar in the lignocellulose material (spent sulphite liquor or brown liquor) which is formed in cellulose cokery, where lignin and cellulose are separated.

Because most of the lignin products must be sugar-free, hemicellulose/sugar must be removed. This is done by letting the stream (spent sulphite liquor or brown liquor) passing through the ethanol factory there the sugar is fermented to ethanol.

The raw material is thus considered as a processing residue - it is not the end product that the production process directly seeks to produce - the main purpose is to produce lignin and cellulose.

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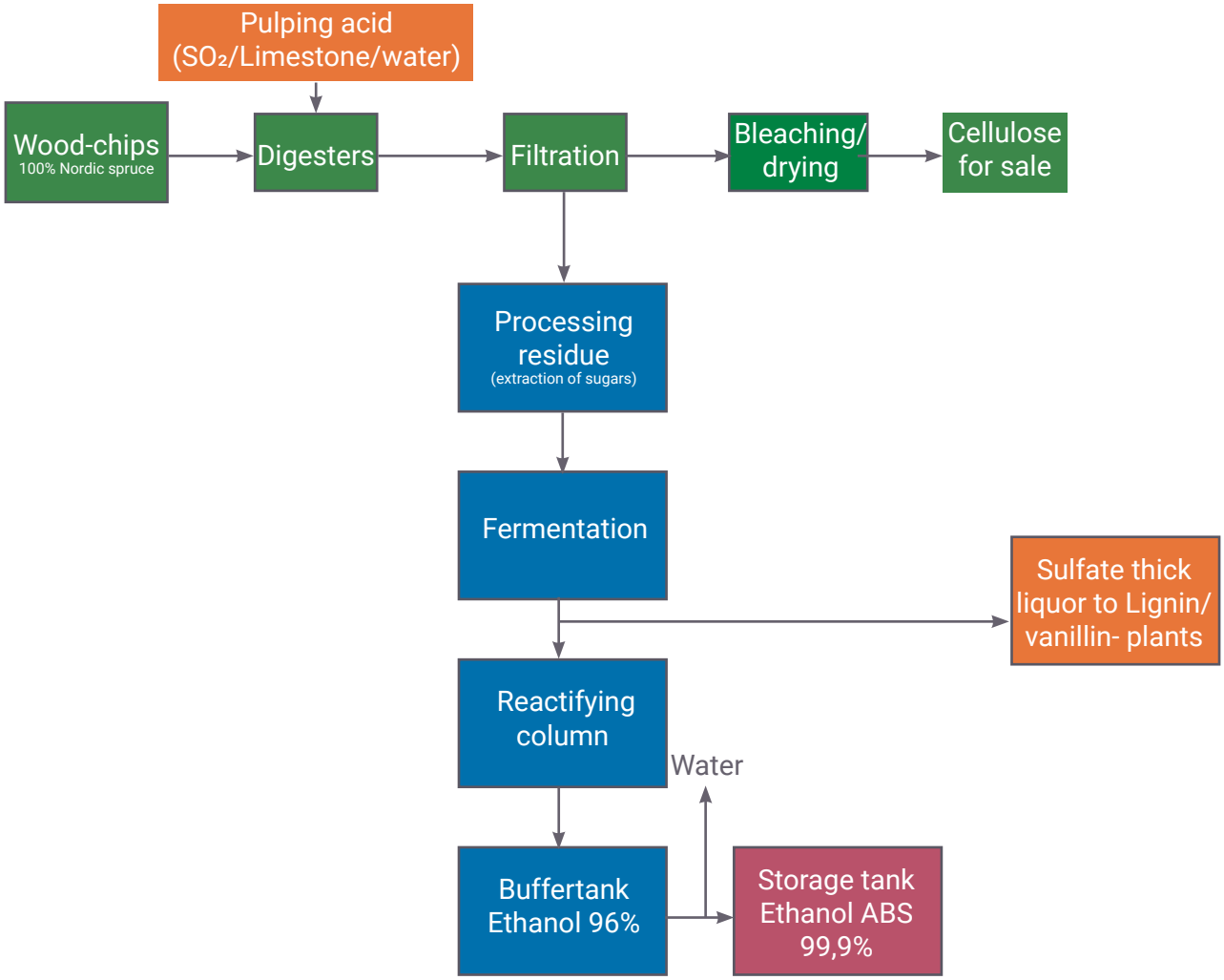
www.borregaard.com

Enterprise No.
NO 895 623 032 vat

ETHANOL SIMPLIFIED PROCESS FLOW CHART



** In order to produce high quality lignin products the sugars most be removed and we have therefor adaptedet our production process so that we can extract theese sugars and utilize them in ethanol production*

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TYPICAL VALUES

Parameter	Unit	Typical values
Alcohol content	Vol.%	> 99.9
Acetaldehyde	mg/l	< 20
Methanol	mg/l	< 100
Ethyl acetate	mg/l	< 10
1-propanol	mg/l	< 50
2-propanol	mg/l	< 100
Isobutanol	mg/l	< 10
Amylalcohols	mg/l	< 10
Conductivity	µS/cm	< 2
Miscibility with water (1+9, 15 minutes)		OK
Apperance		Clear
Smell		Normal smell of ethanol from sulphite lye

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SAFETY

Very flammable in both liquid and steam form. No smoking aloud in close proximity. Needs to be kept away from heat, sparks, open fire and other flammable sources.

Suggested protective wear includes gloves, glasses, and protective clothes.

Can cause serious irritation if in contact with eyes, if in contact rinse with water for several minutes. Remove lenses if applicable.

Container and other equipment should be grounded, and EX secured. Do not use tools and equipment that might make sparks.

The container needs to be sealed closed and stored in a well ventilated and cool area.

In case of fire, extinguish with water fog, powder, foam or carbon dioxide.

CERTIFICATIONS

- ISCC-International sustanability and carbon certificate
- FSC-Forest stewardship council
- ISO9001/Management
- ISO14001/Environmental management
- ISO 50001/Energy management

KOSHER

Certified

HALAL

Our production is safe for Halal consumers.

ANTIBIOTICS

We do not use antibiotics in our production process.

GMO

No GMO is utilized in the production of this product.

MELAMINE

This product is not at risk for Melamine contamination.

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ABOUT US

Our ethanol factory has over the last decade undergone several upgrades allowing us to produce a higher quantity of high-quality ethanol with a purity of 99,9%. Production capacity is linked to cellulose production and may alter.

BORREGAARD

We have one of the world's most advanced and sustainable biorefineries.

By using natural, sustainable raw materials, Borregaard produces advanced and environmentally friendly biochemicals that can replace oil-based products. Borregaard also holds strong positions within ingredients and fine chemicals.

Borregaard employs 1100 man-years in plants and sales offices in 16 countries throughout Europe, Americas, Asia and Africa.

SUSTAINABILITY

Borregaard develops sustainable solutions based on renewable raw materials and unique competencies. Sustainability is the core of our business model. The world is facing great challenges in regards to climate, environment, resources and food production. Borregaard is a part of the solution.

Sustainability is an integral part of Borregaard's business model. This is reflected in the Group's main objective: Providing sustainable solutions based on renewable raw materials and unique competence. Borregaard's innovative solutions can play an important role in addressing the world's greatest sustainable development challenges: population growth and climate change. An increased demand for sustainable products will present opportunities for Borregaard's innovative solutions within a sustainable framework.

For more info please visit www.borregaard.com

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