Summary Series

Possible effects of torrefaction on biomass trade

IEA Bioenergy

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SUMMARY

Global pellet consumption has reached 27 million tonnes in 2014, of which 10 million tonnes for power or CHP, and the remaining majority for heat production. Most of the consumption is in Europe. Today's energy pellets have a very narrow feedstock base that primarily includes soft wood biomass in the form of wood chips or saw dust—only a fraction of overall raw biomass available for bioenergy uses and bioenergy trade. Current wood pellet specifications and qualities still have challenges when it comes to transportability and usability within the existing infrastructure. Low cost preconditioning technologies of raw biomass that can convert and modify different sources of solid biomass into a specification-driven bioenergy feedstock with similar or even better characteristics than coal could greatly enhance trade and usage of biomass in the existing transportation and conversion infrastructure.

The study focuses on the possible effects torrefaction may have on future international biomass trade and markets. The consumption of torrefied biomass is not limited to co-firing fuel in coal power plants, but alternative uses in industry should also be considered, e.g. as potential feedstock for chemical industries and a substitute for coke in blast furnaces.

In respect to the wood pellet supply chain as operated today, torrefied biomass creates many win-win situations along the value chain. Upstream, the broadening of the feedstock base and a lower sensitivity in homogeneity of the input material create the biggest advantages. Downstream, the hydrophobic nature of torrefied biomass allows, to some extent, open storage and transportation. Higher energy density will lower specific transportation costs, brittleness of the torrefied biomass product will allow co-milling in existing coal mills, and combustion characteristics almost superior to those of coal will allow easy substitution in co-firing or complete conversion at lower costs in coal power plants and also other applications. Once compressed into pellets or briquettes, torrefied biomass is of non-hazardous character in transportation. Advantages along the whole supply chain in logistics, storage and handling are likely to (over-)compensate the higher capital costs in the processing.

CURRENT SITUATION

Currently, a number of European, North American and Asian torrefaction initiatives have commissioned first demonstration respectively commercial torrefaction plants. Some are operated under a continuous regime, some are used for testing and optimisation purposes, hence are operated only partially. The market for torrefied biomass has not kick started yet and the current chicken and egg situation – largely related to risk aversion of different market parties - needs to be overcome. The torrefaction sector looks very different from the one presented in 2012. Several parties have left, new ones have joined in. However, many obstacles have been eliminated or

elimination is in process, and a constant development towards industrialisation is seen. Today not only co-firing is seen as key customer for the product; heating and also cooling applications gained interest as well as a parallel development of torrefaction processes for non woody biomass.

Health and security issues related to transport and handling of torrefied biomass were beside the technological issues the main issues being investigated in the sector. It can be expected that within the year 2016 either a ISO Technical Specification or a full ISO standard will be released under ISO 17225-8, which can facilitate dedicated custom codes. This background provides a clearer understanding of the products for market participants.

INTERNATIONAL TRADE FLOWS

All torrefied biomass producers, wherever located throughout the world, will initially consider the European market, and first trade flows will likely focus on European demand. However, demand for biomass import to Japan and South Korea might reach substantial volumes by 2020 while at the same time bioenergy goals of India and China will be increased as well. The continuous growth in coal demand and the increasing competition for this resource will lead to a strong demand for torrefied biomass in Asia. Beside utilisation of local biomass international trade will be boosted with traditional biomass suppliers like Canada, the US and Brazil as players but also new entries like Eastern Siberia, Southeast Asia or certain Sub-Saharan African regions seem possible as the result of such developments.

MARKETS FOR TORRIFIED BIOMASS

The most likely applications of torrefied biomass are co-firing with coal at pulverised-coal-fired power plants and in cement kilns, dedicated combustion in small-scale pellet-burners, and gasification in entrained-flow gasifiers that normally operate on pulverised coal. Industrial-sector usage may be much smaller than the energy sector with regard to volumes of torrefied biomass used, however, demand from industry could drive development of torrefied biomass production and markets in general.

In the iron and steel industry, even full replacement of pulverised-coal injection with torrefied biomass injection could be possible. In the pulp and paper industry, replacement of traditional lime-kiln fuels may be considered. The non-metallic-mineral industry (glass, ceramic materials, and cement) is also candidate to use torrefied biomass. Use of biomass in the chemical and petrochemical industry is to date still negligible; here, torrefied biomass is the most promising of all biomass types even though the right form of application still needs to be found.

Many of the consumers in these sectors have the advantage that demand is much smaller than for instance in coal power plants. This can result in a more organic growth of the production facilities, which will also be much more to the taste of investors.

CONCLUSIONS

It seems that the struggles of torrefaction on level of technological development and logistical approval seem to be overcome and first industrial scale plants have proven scalability. Addressing additional consumer sectors in parallel to coal/biomass co-firing has widened the potential market. The R&D concerning the processing of non woody and often significantly cheaper biomass has proven that marketable and ISO conforming fuels can be produced. Existing and new plants for torrefied biomass production in various parts of the world could stimulate demand for torrefied biomass in different sectors of the economy significantly. It seems that all fundamentals for market success of torrefied biomass are today really provided and ready for market uptake.

The full report can be found at: http://www.bioenergytrade.org/downloads/t40-torrefaction-2016.pdf

IEA BIOENERGY

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