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Implementation and application of Quality Assurance systems

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Abstract

A Quality Assurance (QA) system taking the overall supply chain of solid biofuels into account is essential for an increased trade and use of these energy carriers. A methodological approach is necessary which ensures—besides an efficient control of the single processes considered throughout the overall chain—also the control over the overall supply chain by an adequate integration of previous and subsequent process steps controlled different organisational units. Such a QA-system needs to provide tools to demonstrate that the level of quality demanded by customers is achieved and that their confidence in biofuels is enhanced.

Against this background this paper shows the characteristics of solid biofuels with respect to the necessary supply chain and the need for a Quality Management (QM) system with emphasis on QA and Quality Control (QC). Furthermore, a step-by-step methodology is presented which helps operators running the overall or parts of the supply chain to implement and to apply an appropriate QM-system. Additionally important terms and customer requirements are explained. The system described is compliant with the requirements of the Technical Specification CEN/TS 15234 Fuel quality assurance elaborated by CEN/TC 335.

Keywords: Solid biofuels; Supply chain; Quality Management (QM); Quality Assurance (QA); Quality Control (QC); Process control; Customer requirements; ISO 9001

1. Introduction

For environmental reasons the use of renewable energy sources is a political goal and supported by the European Union as well as national governments. Solid biofuels can contribute significantly to reach these political goals to increase the share of renewable energy within the energy system. Despite this political support solid biofuels will only be used on a large scale within the European energy system if the economic conditions are advantageous. For various reasons, however, this is not easily happening. In many cases, the costs of energy provision are higher for biofuels than fossil fuels.

To achieve this goal the creation of a dynamic and sustainable Europe-wide market for biofuels is needed to create competition—and this will help to reduce the prices. In order to develop such a European wide market the costs for the production and provision of solid biofuels have to be reduced by optimising the interaction between fuel-producer, supplier and plant operator/end-user. A standardisation of some biofuel properties provides information and tools to facilitate the businesses and thus to define the market rules for the different players within this market. Standardisation of pellets for example was one of the driving forces that have enabled a substantial market growth in the last decade since pellet producer, manufacturers of boilers and end-users could benefit from the fact that the fuel properties are clearly defined. Therefore standardisation is a measure to enlarge the markets.

To achieve confidence of customers and regulators within this market, it is also essential that it can be demonstrated that the level of quality demanded by the available combustion devices is reached easily and is stable, and that adequate controls are ensured throughout the overall supply chain.

Due to the complexity of the supply chain of solid biofuels it is therefore important, to apply a Quality

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Management(QM)-system with main focus on Quality Assurance (QA) and Quality Control (QC) within the company that considers previous and subsequent processes of other organisational units or companies.

Currently no QM-system exists in practice in Europe, which fulfils those demands. The European project BIONORM (ENK6-CT-2001-00556) provided scientific information about this field. As one of the outcomes a guideline was elaborated which provides a methodology on how to develop and implement a QA-system within a company dealing with solid biofuels. The considerations of this paper reflect mainly this methodology and aim to provide an answer to the question how companies should act in order to fulfil customer requirements consistently. In this context, measures of QA and QC play a leading role.

2. The need of QA for solid biofuels

Standardisation of solid biofuel properties as well as their sampling and test methods will define the market rules and thus promote a more widespread use of biofuels. It is also essential that the demanded level of fuel quality can be reached consistently, and that adequate controls are ensured throughout the overall supply chain. This is especially of importance for solid biofuels as many different processes are involved.

The fuel quality can be influenced by various factors that are determined by the technology used throughout the overall supply chain, and even more by management. In general it is essential, that the demanded fuel quality—either it follows a standard or site specific customer needs—as well as other requirements of the customer are fulfilled.

The steady fulfilling of those customer requirements can be reached effectively by introducing a QM-system with emphasis on QA and QC. To achieve that, the overall supply chain, i.e., all the production and provision processes, must be controlled. Effective control can be achieved only if each operator throughout the overall supply chain applies QA.

Customers are, or become, aware of possible variations in the quality of the solid biofuels. Consequently, large consumers often test for some properties (e.g., moisture, ash), which are important to assess the value of the solid biofuels they receive. Often, such test-results are linked to the fuel price; as a consequence a lorry load may be rejected when the fuel quality is below a certain level or—if the costumer does not realize a bad quality of the delivery—it could result in a breakdown of the feeding system or of the boiler. If fuel producers or fuel suppliers want to avoid such a rejection or complaints and claims, they must introduce controls throughout their process-chain, up to the point of delivery at the end-users premises. For producers it is therefore a matter of counting costs of implementing a QM-system versus the benefit of avoiding rejection or obtaining a higher price for guaranteed fuel quality. But in any case the application of QM and thereby its part QA can reduce costs because the frequency of testing, i.e., the frequency of the application of QC measures, can be reduced significantly by providing confidence that the demanded quality is fulfilled. Also failure costs during production can be reduced.

The term ''demanded quality'' here refers not only to standardised properties as set in CEN/TS 14961 [3] but also in principle to all requirements of customers. Those requirements differ from case to case in a wide range according to the special local circumstances. Most of such circumstances will be covered by a spectrum varying between

- small-scale (especially domestic) users who require high-grade fuels in a relatively simple conversion installation with narrow fuel specifications, and
- large-scale users who can take advantage of lower-cost raw materials by the use of appropriately designed, fuel flexible combustion units.

Companies dealing with solid biofuels throughout the overall chain also cover a wide range of competences. Some of them buy raw biomass, such as residues from agriculture and/or forestry, and convert them into higher-grade biofuels for the sale to third parties. Others buy solid biofuels for the production of electricity and heat for sale. Examples of both types (as well as intermediate cases) play key roles in the expanding market for solid biofuels. An overall QM-system with emphasis on QA and QC should be applied by all operators—independently of their competences—who are active throughout the overall supply chain of solid biofuels [1].

Currently no QM-system exists in practice in Europe, which fulfils those demands. CEN/TC 335—a Technical Committee from the European Standardisation Organisation (CEN) that issues European Standards (EN's)—has received a mandate to develop standards for solid biofuels. Besides standards on specification and classes of solid biofuels as well as sampling and test methods one of the outcomes of the current standardisation work will be a technical specification (TS) on ''Fuel Quality Assurance''. The methodology developed in the BIONORM project supported the development of this TS. Due to the close cooperation between CEN/TC335 and BIONORM a common procedure could be elaborated and the following considerations are compliant with the future requirements and basics of this TS.

The system for QA as described below does not require a system to be already in force in accordance with ISO 9001:2000, but it may be integrated into an existing one. If the company does not yet have any form of QM, the system described can help to create confidence between all operators active throughout a supply chain, without creating undue bureaucratic complexity.