New fiber needs new technologies!

Conceps for the only renewable and storagable Energy

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Introduction

After more than 25 years working in the renewable energy sector and helping to install more than 2.5 Mio t Production capacity for wood pellets, the new fiber source will be the far bigger market and more complex. All data and Ideas present in the following are from our work in the past, during scientific research and feasibility studies and present the results from different systems to use agriculture areas for energy production. The author worked in different scientific projects and combined the outcome of the work with the need in the future for sustainable and ecological friendly energy needs. Biomass always had the beauty to be capable for storage and makes renewable energy available all day and all year around. Different sources, from residues to dedicated biomass plants will be the new renewable energy source for storable energy. This article shows some of the new fiber sources and technologies to make the energy useable for power plants and even more for small and medium heat plants or CHP's. To use the different fiber source, we will need more than one technology to bring the energy to the market to have the most competitive prices and renewable and CO^2 neutral energy. The advantage of the new fiber sources from agriculture land is the higher yield per year and acre. The bone dry yield is 2 to 5 times higher than the expected yield from forest use. To keep the nutrients balanced and to stabilize the yield, all land using systems have to bring the nutrients back or use fertilizer to secure stable grow. The different systems have to prepare the biomass in such a way, that the product can be used in existing coal burner. Only the products which can be used in coal fired heat plants or CHP's will find costumer for the new developed product. If the existing coal plant can use the new biomass without expensive conversion, then the new fiber source can be a competitive product. To bring the different "ifs" together we need complex systems to handle the objectives around the new biomass sources. The article will show three different systems to use biomass from new sources. This three are only a starting point to show examples for the wide range of biomass, land using systems, conversion units and renewable energy products.

The new fiber sources

The fiber from agriculture land can be used as residues (Straw, hedgerow trees or Others) or produced as dedicated biomass (Grass, Maize, King Grass or Others) or

used as a part of the land using system (intercrops or two plant trimmings). The fiber has to be “treated” to be used in a coal burner. This treatment has to make sure that the “inhomogeneous” burning ingredients in Biomass securely converted to “homogeneous” burning energy like coal. The conversion is mostly a rejection and cracking of some parts and using the off gassing energy during the treatment process. Another objective of coal is: you can store the energy outside at all whether conditions. To reach this behavior with biomass the treatment has to be perfect. There are different ways to meet these requirements with biomass.

Biomass from residues

One source for fiber is the use of straw. Many projects and technology tried to make the fiber source competitive, but unfortunately the transport cost for the straw and the existing conversion system to energy are not competitive to other sources. To make the fiber source work the following system can be used to fuel the marked with renewable energy. The system is very complex but the use of all parts of the delivered energy is the key for a successful project.

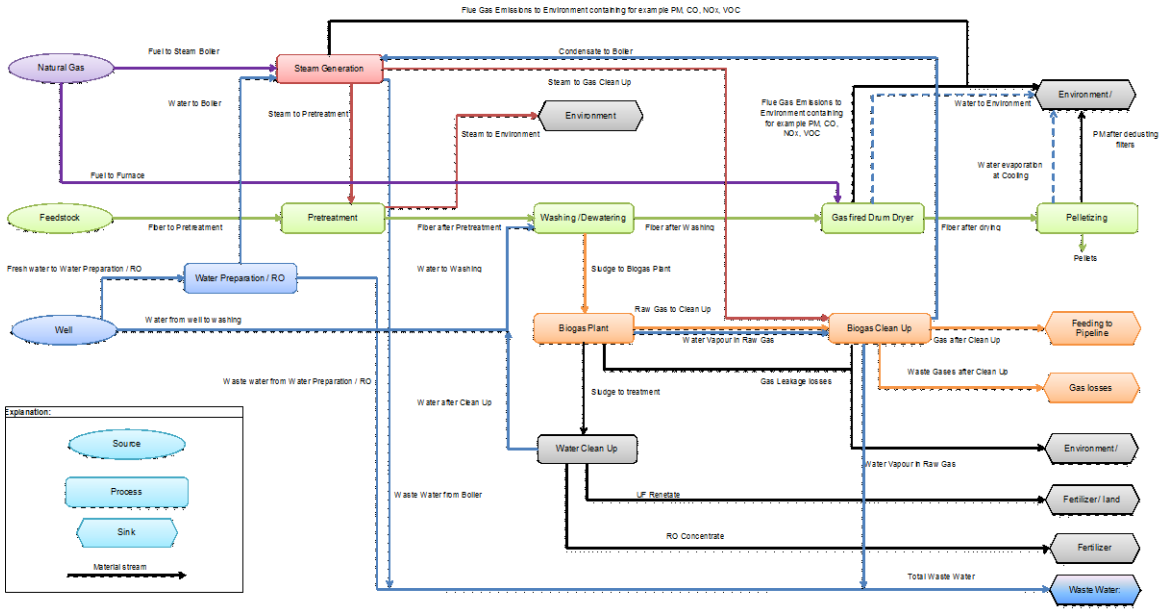

Figure 1: one system to produce solid carbonized fuel and natural gas

Figure 1 presents a system to produce fuel similar to coal and generate natural gas as a byproduct. This system will be very interesting in agriculture areas who need additional income out of existing land use systems. The advantage is the logistic to and from the plant. Nevertheless, the use of an old biomass source with new technologies will bring additional benefit to agriculture business.

Dedicated biomass crops

Land using systems are flexible when yearly crop rotation is the standard procedure. Therefore, a part of the land or even in some areas the total land (land conversion from unused areas) to produce dedicated biomass, can be used. To produce a sufficient benefit from agriculture areas and produce sustainable and ecological correct, we need

reuse the nutrients in the plants to reduce cost and chemical or any other input from outside the system. Only an ecological and sustainable land using system will be successful in a long run. The soil health will be the criteria in new systems to present

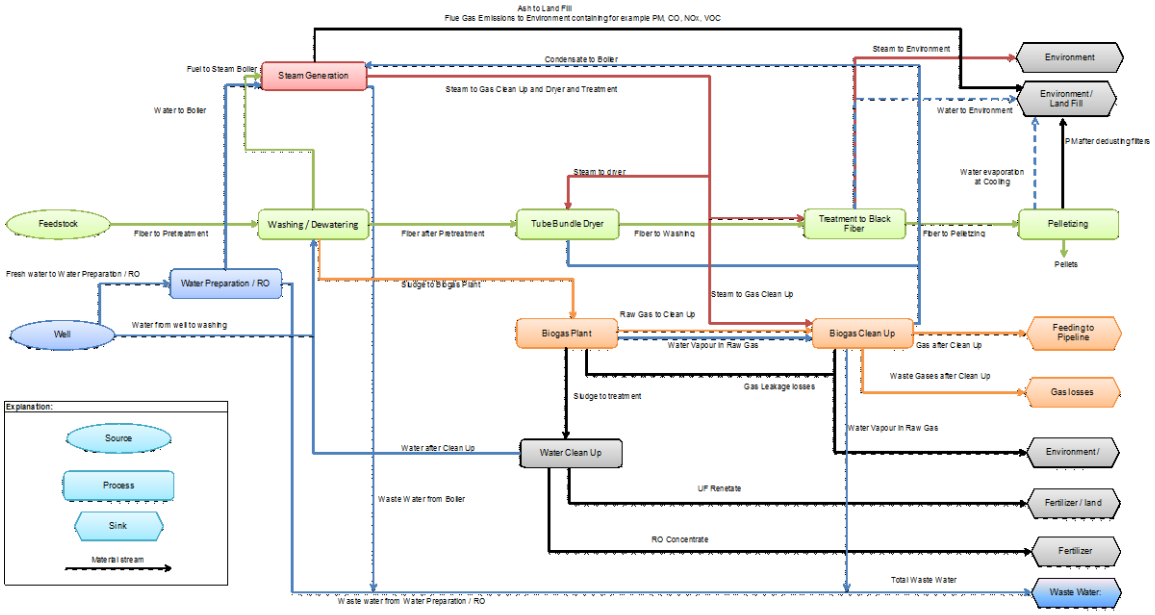

Figure 2: Combination of leching fiber and corbonizing treatment

benefits from new agriculture land use for energy production.

Figure 2 presents a system to use agriculture fiber for the production of treated biomass. This treated biomass is the fuel for existing coal plants and carbonizing treatment rejects all fast burning elements and the most VOCs. The following chart gives an over few of the new washing and dewatering system, which can be used for agriculture fiber to clean and reduce the water content before carbonizing treatment. The advantage to use a leaching before drying is the reduction of minerals and the reduction of energy for the drying process. The minerals as described before used as fertilizer for further production. In figure thee, we present the date from our leaching before treatment and drying. The data shows that up to 90% of the nutrients collected from the harvest fiber can be recycled before using the fiber as energy source. This system will be very sustainable and cost efficient for all fresh-harvested biomass.

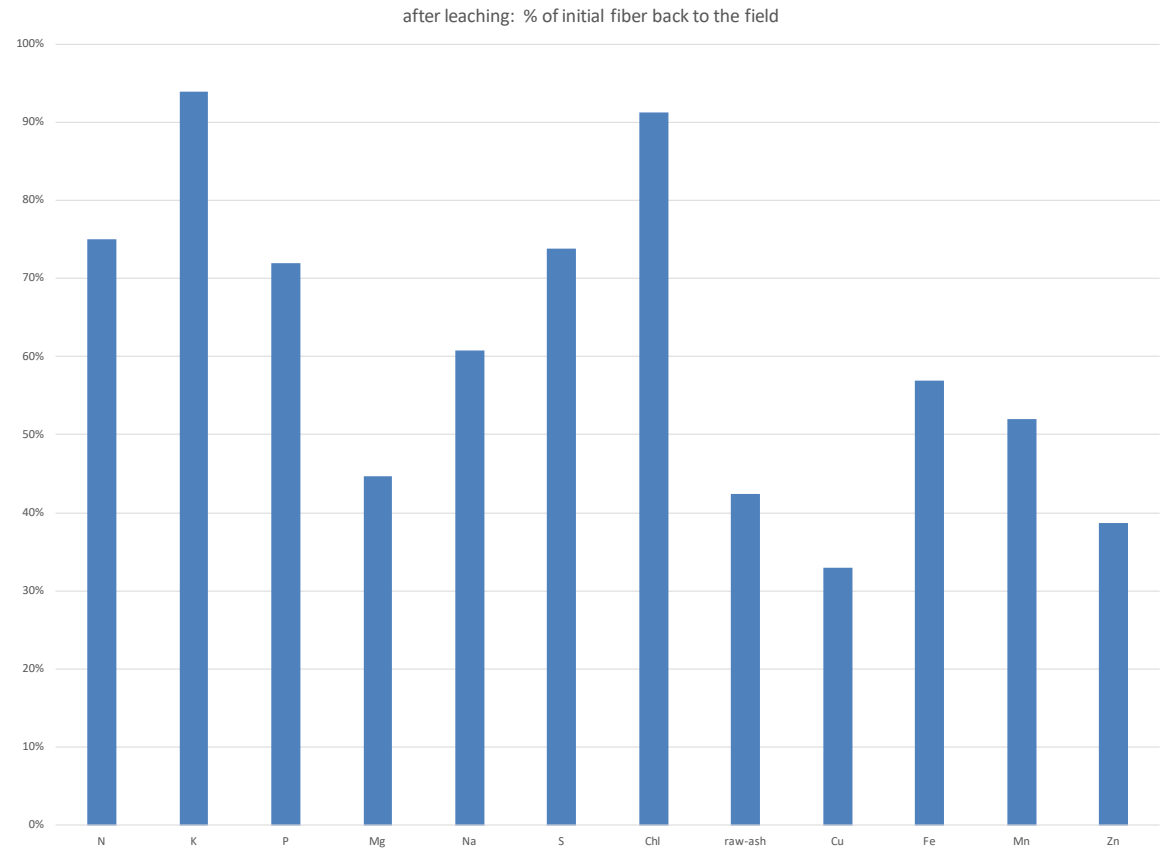

Figure 3: Nutrients back to field

Dry fiber to black fuel

Coal fired plants usually handle ash contends from 5 to 45% with different technology's. The different to biomass is the combination of the minerals. The total amount of ash in dedicated biomass plants usually never increase 20%. To combine the low ash content and the missing minerals for low ash melting point additives can be helpful. Treading Biomass and mixing additives into the fiber will lead to a solid fuel close to coal characteristics. The aim and challenge will be to run those systems with low operation costs for the handling of higher ash content during production and use low-grade biomass as a cheap fiber source. Therefor briquetting instead of pelletizing can reduce wear parts during densification and reduce operation cost.

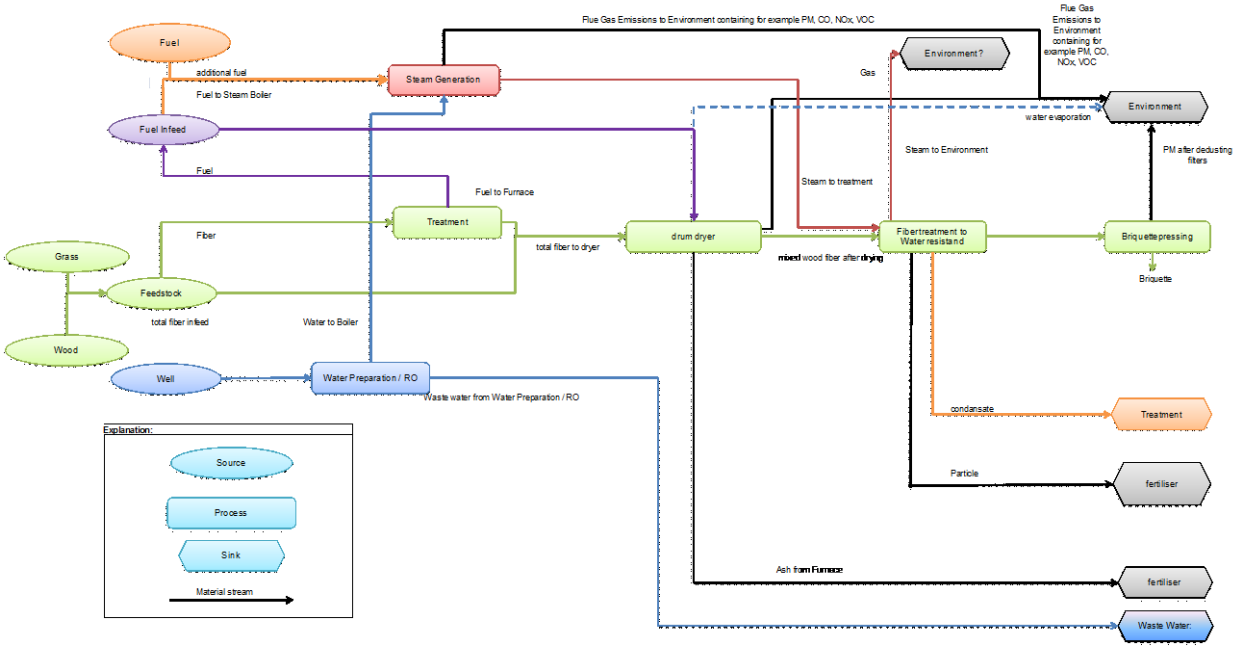

Figure 4: combination of wood fiber and grass for carbonizing treatment

Results

As all the presented systems shows, there is a technology for any biomass available. This more complex system is a challenge and can only be successful if the use for sustainable energy, produced in an ecologically friendly way is the marked for those products. There is no way to be competitive to fossil fuels without including the external effects of new biomass sources into the economics of existing fuel supply chains. The external effects of new biomass to coal systems are the increasing land use for set-aside areas and unused left agriculture areas due to non-profitable land using systems or regulations for food production. The use of “traditional energy” Biomass as Wood is, will always be the starting point to convert to a fossil energy free future. The new fiber sources with new conversion to coal-type biomass is the flexible solution for non-forest areas and the higher yield per acre will bring more energy to the market.

Outlook

As of today, the Biomass market focus using wood fiber and low-grade residues. Only a few projects trying to install sustainable and ecologically friendly energy conversion systems to reduce the use of fossil energy. The pressure one the Industry is still low to invest in renewable energy projects as long the oil- and gas-prices low and CO^2 credits are cheap. If the use of fossil energy strictly reduced or rejected from the primary energy marked, the demand for biomass will grow. Only land using systems with high yield will be successful in a long run and the presented examples are only a start of new land using systems. The combination of special plants and new technologies will be the key to support the energy marked in the future.