

Exploration of the Application of High and New Technologies in Grain and Oil Processing

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Abstract. The State Administration of Grain has released the *Suggestions of Popularizing the Utilization of High-Tech in “Eleventh Five-Year” In Grain Industry* and the *Comments And Suggestions of Mid-Long Term (By 2020) Scientific and Technological Development Plan of China’s Grain and Oil*, and has vigorously promoted the application of high-tech in grain and oil processing. This shows that our country has already paid high attention to the high-tech and the industry of grain and oil processing. This thesis launches the discussion about it, describes some kinds of high technologies and briefly describes their applications in grain and oil processing.

Introduction

Grain and oil processing industry is an important component part of a country’s economic development, and it also has a certain influence on agricultural development and food processing industry. Developing grain and oil processing industry can promote the national economic strength, make guarantee for the development of people’s livelihood, provide ways for increasing both production and incomes of China’s companies, urban and rural residents, and it also has a positive push role on the selection of agricultural cultivation^[1]. In the new period of agricultural development, especially in the new century, our country’s grain and oil processing industry has also made a rapid leap-forward progress with the support of agricultural development, and all kinds of high and new technologies have constantly been applied into the grain and oil processing, which greatly improves the size and strength of many enterprises in our country. However, there is a certain gap between our country and some developed countries, in some western developed countries, they use advanced science and technology, biological and ion-exchange methods to push their countries’ paddy processing to a new step, so they win the advantageous positions in the market, enhance the competitiveness rapidly and get high profits. On the other hand, in the process of producing grain and oil, they mostly use computers to make control, and this automatic and high-efficiency product method makes them produce thousands of tons of special flour every day.

Many kinds of high and new technologies applied into grain and oil processing

High and new technologies can be utilized in deep processing rice, flour and oil, which impels to multiply the resource of grain and oil^[2]. Now, the author lists some kind of high and new technologies in grain and oil processing which are more common and advanced in the world, and then, the author will introduce each of these technologies.

Mechatronic technology. Mechatronic technology is an essential high and new technology which is used in deep processing rice, flour and oil by developed countries in the world. It is applied into the whole process of storage and transportation of the raw material, retaining freshness, processing products, controlling quality, storage and distribution of finish goods during the grain and oil processing, and it is also an important type of technical means to make the grain and oil processing achieve high efficiency, high quality, safe and low consumption.

Biological technology. As one of the core technologies of the High-tech in 21st century, the biological technology has a wide application prospect in the grain and oil processing industry. When the biological technology is applied, a variety of bio-enzymes selected play important roles on deep

processing grain and oil, for instance, the deep processed products such as starch sugar converted by cereal, ultra-high-pure rice starch, porous starch, high-protein flour, ultra-high-pure rice protein, rice bran protein, rice bran nutrient, inositol and so on all need biological technology, enzyme engineering and a variety of enzymes including amylase, saccharifying enzyme, proteinase, lipase, cellulase, phytase and so on. This shows that the biological technology has also gradually become one of the essential technologies in grain and oil processing industry. Besides, tissue culture technology, genetic engineering technology and others involved in the biological technology have been widely used in different kinds of fields.

Extrusion technology. At present, there are many developed countries in the world applying extrusion technology and making use of this technology for processing grain and oil and manufacturing food. Extrusion technology has strong production capacity and lower cost, it only needs one extruder as a core facility to process raw material, the shapes of the products produced by the application of the extrusion technology are varied. At the same time, the extrusion technology can improve resource utilization. So, the extrusion technology is always widely used in making breakfast and snack foods. There are many foods in our lives that produced by the application of the extrusion technology, for instance, some breakfast cereals, pieces of bread, instant tea, candy, chocolate and so on.

Ultra-fine crushing technology. Ultra-fine crushing technology is the one which is most commonly used in deep processing grain and oil by various countries around the world. One of the technology is ultra-fine crushing by high pressure airflow developed from 1960s to 1970s, which is widely used in the industries of converting the resource of grain and oil to food, medicine, cosmetics and others. Using ultra-fine crushing technology can crush the starch grains to 2-3 μm and crush the cellulose to a few microns, and this technology has a very important application value on deep processing grain and oil and comprehensive utilization of byproducts.

Membrane separation technology in grain and oil processing. Membrane separation technology is a kind of way to separate partial solvent and solute in the solution mainly by the properties of polymer semi-permeable membrane, and it is often used in grain and oil processing. Besides, this technology is mostly used in oil and fat processing, and it is used to make oil and fat be deacidification under the physical process conditions, as this physical method is more effective than other methods of refining, it is widely used. At the same time, it can greatly reduce the investment of the equipment, with lower consumption of the steam and the cooling water during the whole refining process and better deodorization, so, membrane separation technology can make the process of separating oil and fat of grain and oil more simple and convenient, maximum save energy, reduce consumption, and have great potential in terms of market application.

Supercritical fluid extraction technology. Supercritical fluid extraction technology is widely used in grain and oil processing, and it belongs to an advanced extraction technology. This technology is researched and applied from the nature of the liquids in the supercritical surface. Liquids can have two properties of liquids and solids at the same time in the supercritical surface, so it can have higher penetration capacity and relatively lower paste degree, and show dominant role on dissolving. The soluble ability of the solute will change along with the changes of outside temperature and air pressure, then, dissolution and separation will be done on the basis of this change. In general, carbon dioxide is used as an extraction agent in grain and oil processing, which can get better effect compared with the traditional distillation technology, and greatly shorten the extraction time, then, it plays a positive role in promoting the whole grain and oil processing, and it also has the properties of non-oxidizing deterioration, safety and health.

Micro-encapsulation technology. Micro-encapsulation technology is a micro-packaging technology of storing solids, gases and liquids. Using this technology can effectively protect the functional powdered oil, grain and oil and by-products, after micro-encapsulated, some high value-added products which are easy to oxidize and deteriorate can extend their duration of storage and keep their original functions for a long time^[3].

Status and development directions of China's grain and oil processing industry

Proceed into the 21 century, with the emergency of various high and new technologies, China's grain and oil processing industry faces new opportunities and challenges. Grain and oil processing occupies a significant position in grain and oil production, and it is related to the health of China's people's lives and helpful to solve the problems of "villages, farmers and agriculture." So, the application space of high-tech in China's grain and oil processing industry must be increased constantly^[4]. However, at this stage, China's grain and oil processing industry has made some progress, but there are still many disadvantages in the investment of some science, so, the relevant departments need put more efforts in scientific studies, turn the situation that China's grain and oil processing industry is lack of self-innovation around, raise our innovative capacity, and promote the healthy development of China's grain and oil processing industry. Therefore, enterprises in China's grain and oil processing should take the following measures to popularize high and new technologies constantly and integrate these high and new technologies into grain and oil processing effectively for promoting the development of the enterprises and our country.

Actively applying all kinds of high and new technologies to improve the rate of resource utilization. Progress and development of China's grain and oil processing industry need the support of advanced science and technology, so, high and new technologies are the important base of the development of grain and oil processing industry^[5]. Each big enterprise in China should strengthen the research of industrial subjects, cooperate with the enterprises in advanced countries, create the large companies' R & D centers with greater strength which belong to our own country. That can play a positive role in the perfect innovation mechanism for using present science and technology to constantly develop new products and processes and promote the progress of making grain and oil processing industry into modernization.

During the market development and industrial competition, domestic enterprises should focus on analyzing some technologies that can obtain high profits, such as biological technology on deep processing the rice, ion-exchange technology, membrane separation technology, super-micro technology, efficient drying technology and so on, and take these as the development goals of rice processing industry^[6]. Domestic enterprises can also combine the two technologies of computer management and intelligent control technology and apply these in the process of wheat flour milling, with different kinds of sensing device, using computers to effectively manage the productive process for using wheat resource as rationally as possible and ensuring that the equipment with high efficiency and stable operation can run during the whole productive process. Maximize the application of the biological technology and apply some effective and safe biologic additives reasonably and effectively for achieve the goals of improving food and flour quality and avoiding the formation of some related additives of the existing chemicals during the productive process. Besides, process maize by the application of closed cyclic process and large wet grinding process and reasonably control related productive process by computers for making the entire productive process transparent, being more convenient for process supervision, adjusting and changing the process randomly, and making sure that maximize the comprehensive utilization of corn oil, fiber, corn flour and so on. Develop grain and oil industry further according to the analysis by chromatogram separation technology, modern biological enzyme technology and super-micro technology.

From the perspective of oil and fat processing, when processing the soy, advanced membrane separation technology, fermentation technology, enzyme technology, extraction separation technology and others should be reasonably applied to increase the oil and protein extracted. Utilize the biological technology to modify and analyze the oil, and make rational use of separation, cold pressing, extrusion and other related technologies during the oil industry of rapeseed to raise the oil yield and oil production rate.

In recent years, most developed countries focus on researching and analyzing the high-efficiency and value-added conversion and application of rapeseed and soy, which gradually become the directions of future development with the progress of society. When manufacturing and processing the rapeseed and soy, new technologies are not only used in some mass production of edible vegetable oil, in non-edible areas, new materials are reasonably analyzed including film, packing

material, reinforcement material, soy protein biology, adhesives, biodegradable polymers and so on. Develop and research dehulling and cold-pressing oil technologies of double-low rapeseed, analyze and utilize different kinds of soy functional food, and develop some functional products with high value-added, high quality, high benefit and special nutrition. It can be seen that efficiently increasing the added value and technological content of the grain and oil products must become the direction for the research and development in future China.

Increasing the investment of science and technology, and constantly developing new technologies and new equipment of grain and oil processing. During the procedure of deep processing the grain and oil, the machining technology is the foundation, the machining equipment is the precondition, the machining process is the core, and high quality functional products or food can't be produced without any of these three ones^[7]. At present stage, foreign developed countries have already mastered a high level of grain and oil processing technology, according to some advance technology and production equipment, they can produce some more advanced products with better product performance, high capacity of single production and high product quality. Be equipped with a certain level of machinery automation. For instance, using light, liquid, mechanical, gas and other related technologies and organically combining with automatic inspection technology and computer control technology, with the equipment that ensure continuous production, can partly improve the degree of enterprises' production automation. In the last few years, China also continuously introduces and selects the products from the foreign capital enterprises, while keeping this situation for a long time, this will seriously affect the R & D and production capacity of China's grain and oil processing equipment, which is detrimental to our development. Many countries and transnational corporations have already spoken highly of China which has vast territory and abundant resources, and they have already found that China is a grain and oil processing market with huge potential. Therefore, we need make more efforts, constantly increase investment of science and technology, and actively develop and research advanced, applicable, economic, safety, reliable technical equipment, all those have become the urgent tasks of many researchers. Our country should clear the emphasis of developing and researching the grain and oil processing equipment. First, the new equipment researched must have the features of high-tech, just like the membrane technology facilities; Then, a set of large-scale oil production equipment need to be manufactured, which is also consistent with current China's situation; Once more, ensure that the whole production process have a certain automation capability, and guarantee the online monitoring and quality control of the production process with combination of the modern information technology as much as possible; Last, strengthen the capacities of maintenance and overhaul of the grain and oil processing equipment, and make sure that those equipment can run stably for a long time. All in all, we must improve the technological content of China's grain and oil processing equipment and products, and further enhance the competitiveness of cereal and oil foods in international trade, which plays a certain role in promoting China's economic strength.

Conclusions

Today, the international trade gradually converts to the direction of integration. In order to guarantee our country keep the invincible position in the international competition, we must fully utilize, emphasize, research and develop the high and new technologies with modern significance and reasonably apply those into grain and oil processing industry, at the same time, grain and oil processing equipment need to be constantly improved for increasing the product quality of grain and oil after deep processing and enhancing the resource utilization. All those can make China's grain and oil processing industry get rid of the shackles of the traditional technologies, truly realize that the food add value, the agriculture increase the efficiency and the farmers increase incomes, and accelerate China's pace of joining the list of developed countries.

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