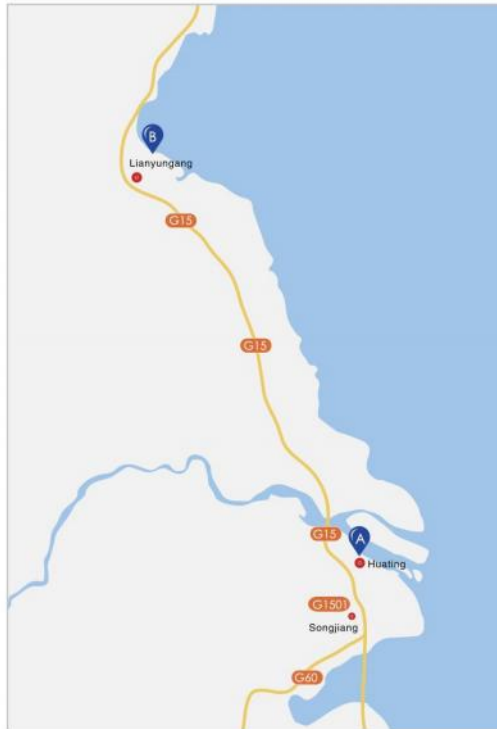




All rivers flow into the sea, Mount Kunlun is top in the sky
Great virtue can carry all things, Truth-seeking and innovative



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2023



ENGINEERING PROJECT

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Bailun spirit:

Customer foremost, seeking quality, fairness and honesty,
continuous improvement and innovation!

Bailun mission:

Holistic solutions for synthetic biology!

Bailun vision:

Innovative intelligent data-driven biological system service provider!



COMPANY PROFILE

Bailun Biotechnology (Jiangsu) Co., Ltd. is a leading supplier of intelligent data-driven bioreactor systems in China. Products cover all kinds of bioreactors in laboratory, pilot scale and industrial production, including fermenter, animal cell bioreactor, plant cell bioreactor, single-use bioreactor, liquid dispensing system and disposable reactor, etc. Can produce bioreactor of 0.1L-1000KL volume and technical services, and provide intelligent and personalized comprehensive solutions for bioreactors process. Bailun has a large number of experienced fermentation process, biochemical equipment and chemical technical engineers, many famous experts and scholars as the company's technical consultants, Bailun forever pursuits to create value for customers, and adhere to customer-centric is the core value of Bailun.

In order to optimize and enlarge the production of process products in biological processes, various problems in the process need to be studied, therefore, a variety of research instruments and equipment are designed, and various conclusions are obtained through experiments and used in production practice. This equipment for the study of biological processes can be divided into seed material studies of living cells with the main objective of synthetic biology, and problems arising from changes in the transfer characteristics of process mixing, for which various bioreactor devices have been formed. To this end, the company to the above content as the goal, combined with the actual situation of users organized a series of devices for research products. Among them, there are products for high performance cell line acquisition device, biological reactor products for obtaining bacterial physiological characteristics, experimental equipment for biological process optimization and amplification, bioreactor system for intelligent biological process, as well as a variety of measurement, sterilization or sampling manual operation, data processing software packages, GMP operating characteristics and other components research products for users to choose.

Bailun Spirit:

Customer foremost, seeking quality, fairness and honesty, continuous improvement!

DETECTION TEST

The whole process of production monitoring is the guarantee of product quality. To create excellent quality with the spirit of craftsmanship is the purpose of Bailun, so we have established a complete and orderly quality assurance system. Under the guidance of the "pursuit of zero failure" idea, we firmly believe that not letting any defective product leave the factory, is not only responsible for the customers, but also responsible for ourselves.



Surface roughness



Flaw detection



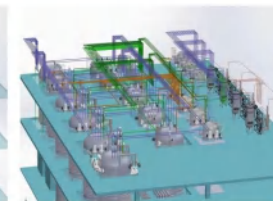
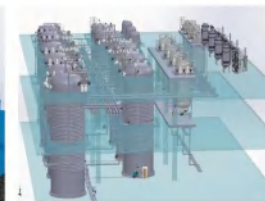
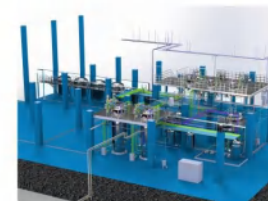
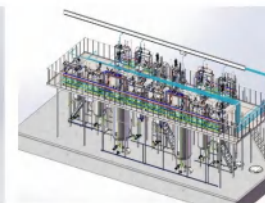
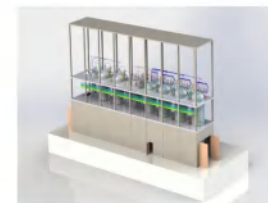
Non-destructive thickness gauge

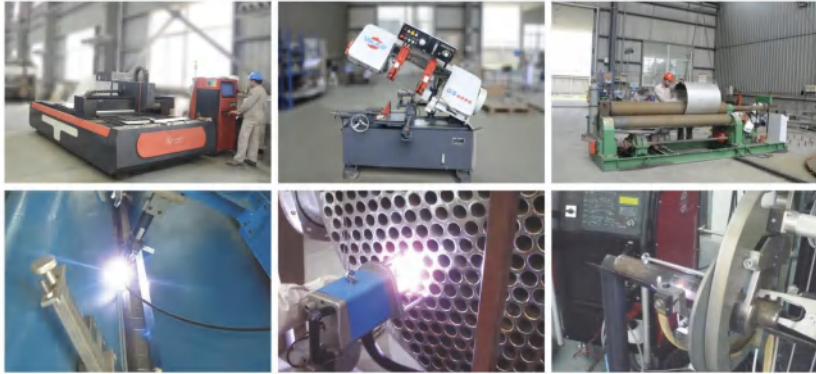


Material spectrometer

3D DESIGN

3D design, combined with the actual situation of the site, to provide the optimal designing scheme.





PRODUCTION SITE

Advanced automatic production equipment, excellent assembly line production, showing first-class quality. Technical experts are directly involved in production to ensure the quality and stability of products. The increasing awareness of quality products and a steady stream of industrial quality products make Bailun develop with each passing day. No matter how the world changes, Bailun people's persistent spirit of excellence remains unchanged.

Standardized production cast enterprise strength and brand!



BAILUN QUALIFICATION

Honor exists because of customers: because all our efforts are for the satisfaction of customers. Honor is the affirmation, trust and spur, honor is our golden card and pass, honor is our signpost and a journey, Honor represents the past. Bailun people regard honor as an inexhaustible motivation to encourage their own continuous improvement and progress.



First-class quality, from the innovation of technology!



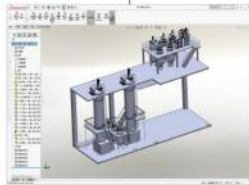
EPC ENGINEERING PROCUREMENT CONSTRUCTION

Bailun provides turnkey solutions for process lines. We have comprehensive service capabilities and can be responsible for the conceptual design from the beginning to the final commissioning according to the specific requirements of customers.

Engineering design, equipment selection and procurement, installation and construction and project management as one of the project contractor service providers.

● Pre-design

- Strategic program consulting
- Feasibility study
- Conceptual design
- Design scope definition



● Project Management

- Basic engineering management
- Detail engineering management
- Project team communication platform
- Cost control
- Project planning and schedule
- System control integration



● Procurement Management

- Select equipment and instrument based on user requirements
- Strategic procurement
- Evaluation of qualified suppliers
- Equipment quality assessment and quality management services
- Contract management
- Logistics transportation



● Process Control

- Construction management
- Equipment supply and installation
- Quality control system
- Safety guarantee system
- Contractor management
- Utility facility integration

● System Acceptance

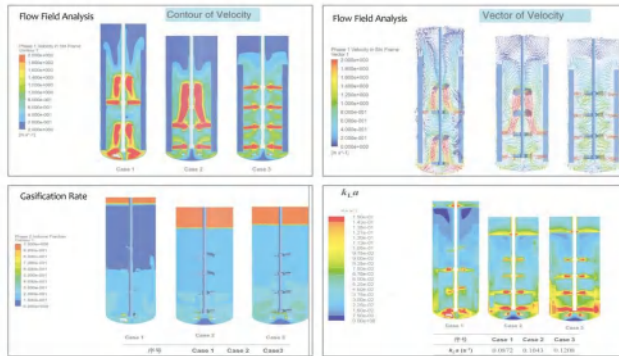
- Pre-commissioning
- Factory commissioning
- Verification and documentation
- Production trial run and engineering support
- Training
- Completion document



CFD FLUID DESIGN

We master advanced process design capability and engineering integration capability. The R & D team is skilled in the use of Auto CAD, SolidWorks, Pro-E and other design software for professional design and development of process modules. Based on the layout of users' URS and workshop, according to user requirements, we provide integrated solution and manufacturing, installation, service and verification support of integrated equipment to users.

Through the study and analysis of fermentation process characteristics of high oxygen consumption fermentation products, combined with our experience in bioreactor system design, a set of bioreactor system which can meet the requirements of fermentation process of the product was put forward. The whole reactor design scheme was verified by computational fluid dynamics (CFD) method from the perspectives of flow field, mixing and mass transfer.



ONLINE AMPLIFICATION DESIGN SOFTWARE

Scaling up of bioreactors can be thought of as keeping all scale-independent parameters constant while prioritizing which scale-dependent parameters remain constant. Due to their interdependence, it is almost impossible to keep all scale-dependent parameters constant throughout the amplification process. For example, if the stirring rate is maintained throughout the scale to maintain mixing time, the impeller tip speed will increase with the scale, possibly causing cell damage. On the other hand, if the impeller tip speed is kept constant at different scales, large bioreactor containers will significantly reduce the stirring rate and thus increase the mixing time. In addition to mixing differences during amplification, gas transfer characteristics can also be significantly affected. As a result, there is no single effective way to scale up bioreactors because critical trade-offs must be made. This is further complicated by the fact that best scale-up practices used in industry are often confidential. Therefore, scaling up cell culture systems remains an art, often relying on trial and error to determine the best process parameters and operational strategies.



ANTIBIOTIC TECHNOLOGY

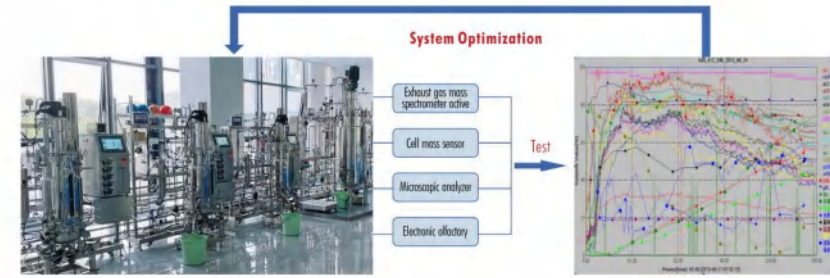
Our country is the world's biggest producer of antibiotics. As antibiotics are secondary metabolites of microorganisms, metabolic regulation is complex, generally important production bases have small and pilot workshops. Our research center has multi-scale optimization theory and method for the detection of biological process parameters, which can greatly improve the production of antibiotics. The picture shows the small workshop and pilot workshop of a factory.



ESCHERICHIA COLI /PICHIA PASTORIS PROCESS AMPLIFICATION

Culture using Escherichia coli/Pichia pastoris as vector; The bioreactor with height to diameter ratio of 2.5-3:1 was suitable for mass and oxygen transfer of E. coli/Pichia pastoris. Methanol, ammonia water on-line sterilization filter feed.

In the fermentation process, the process tail gas mass spectrometer, online living cell volume sensor, online microanalyzer, biological electronic olfactory analyzer were used to determine and analyze the physiological and metabolic characteristics of the bacteria, the morphological changes of the bacteria, and the changes of the products and byproducts. According to the correlation change of process curve, the correlation between macroscopic physiological metabolic parameters and intracellular product synthesis, as well as the corresponding change rule of physiological metabolic characteristics in the byproduct formation process were found. The key nodes of metabolic control in the relevant fermentation process were studied, and the systematic process optimization was carried out.





ASTAXANTHIN /DHA/ARA PROCESS

The field of astaxanthin fermentation involves a variety of hosts. Such as algae with *Rhodospirillum rubrum*, bacteria with *Escherichia coli*, yeast with red *Fife* yeast, *Saccharomyces cerevisiae*, *Lyophilus* yeasts and so on. The fermentation conditions of these hosts are very different, and the specific tank conditions are verified by engineering modification. Astaxanthin is a kind of antioxidant, which has broad application prospects in health care products, medicine, cosmetics, food additives and aquaculture. At present, there are many researches on synthetic biology, among which a lot of work has been done in engineering DNA and molecular biology. However, when it is used in industrial production, *Rhodospirillum rubrum*, *Escherichia coli*, *Saccharomyces cerevisiae*, *Saccharomyces cerevisiae*, and other host cells have been used, and their metabolic conditions are very different. The research and development center of the company has the basic research of synthetic biology and fermentation engineering. Using the research equipment developed by the company, the process data optimization and amplification are well completed. The picture shows the industrial scale-up of the pilot test and production equipment.



MICROALGAE PROCESS

Microalgae is an important source of algae to obtain secondary metabolites or algae energy, it can be photoculture, autotrophic culture or mixed culture to obtain the products we need, so there are many research methods of algae culture. The picture shows the site of the microalgae test and production facility developed by our company.





LYSOZYME PROCESS

Large tonnage high density culture lysozyme production system, to meet the mass transfer requirements of 100T tonnage high aerobic; The tank structure, mixing system and ventilation form are optimized to meet the requirements of equipment OTR and reduce production energy consumption.



SODIUM HYALURONATE PROCESS

Aiming at the characteristics of hyaluronic acid fermentation with high viscosity, a stirring system including internig slurry was designed on the basis of the study on the rheological properties of the fermentation liquid, which solved the problem that with the increase of the fermentation yield, the fermentation viscosity gradually increased, while the oxygen transfer efficiency decreased sharply. At the same time, considering mixing and heat transfer, the blade diameter is appropriately increased to improve the mixing efficiency.



COMPANY PROFILE

Polysaccharide is a kind of polymer compound which is important to the composition of living organisms. It has many physiological functions and is closely related to human life. For a long time, polysaccharides are produced by the traditional backward fermentation method. In recent years, with the deepening of the research on polysaccharides, people began to have a large number of demands. How to use the modern reactor method to study has become an important topic. The company accepted the user's requirements, according to the small trial and pilot study, formed the process equipment method as shown in the picture to solve the production problem.

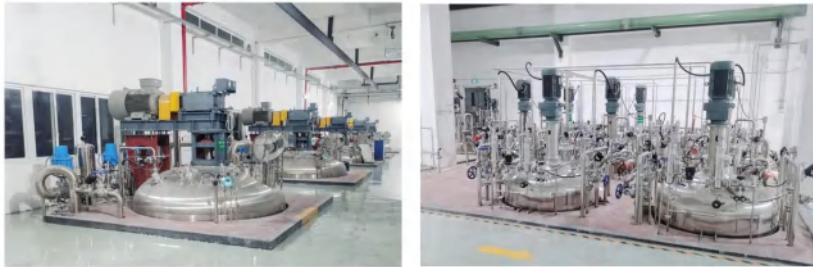




BIOFERTILIZER PROCESS (TRICHODERMA HARZIENSIS)

Biofertilizers have low price and low operation requirements. They are generally carried out under natural environmental conditions with low requirements. This biological fertilizer production requirements are special, using the company's products can be strictly controlled, greatly improve the biological activity and yield.





CALCIUM PANTOTHENATE PROCESS

This is the calcium pantothenate production process jointly studied by the user and the design department of our unit after technology transfer. The picture shows the test workshop and the production workshop site of our manufacturing.



AMINO ACID PROCESS

According to the requirements of users, the process research center of Bailun Company has advanced synthetic biology and fermentation engineering technology, and can use the small scale or pilot test equipment provided by the company to study the product process technology together with users, so as to achieve the goal of product process optimization and amplification. Then the company's engineering design department conducts the overall design of equipment, our talent team of machinery manufacturing, automatic control and organization management forming a leading and high-quality professional team in design, equipment processing, manufacturing, and installation, achieves the international professional level.





CONTINUOUS STERILIZATION SYSTEM TECHNOLOGY

The continuous sterilization system is an original creative technology of our country. This technology has the characteristics of high temperature rapid sterilization, short sterilization time, less destruction of medium, high efficiency and energy saving, reducing labor intensity. But for a long time the use of the device principle is backward, low efficiency and takes high maintenance cost, therefore our company adopts the full heat transfer technology which uses , computer controlled temperature cascade regulation. In the result, the nutrition retention rate is higher than 92%, saving, more than 50% steam, and more than 70% circulating water.

BIOLOGICAL PESTICIDE TECHNOLOGY

Biopesticides are a big category of products with various varieties and wide uses. In order to overcome the shortcomings of chemical pesticides, people begin to use a large number of biopesticides, among which fermentation is the most important method. After solving the metabolic regulation problem of biopesticide on the pilot equipment studied by the company, the design department designed and manufactured the relevant equipment according to the existing experience.

