

Design and Build Grill and Retort Basket Design Based on Autodesk Inventor Software at PT Banyuwangi Cannery Indonesia

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ABSTRACT

PT Banyuwangi Canenery Indonesia, which is based in Banyuwangi, Indonesia, has been growing and winning over a lot of clients. Up till now, the canning sector has developed and updated its infrastructure. Grills and retort baskets were erected in the gutters by PT Banyuwangi Canenery Indonesia. R&D is a term used to describe one approach to research and development. Research and development, also known as study and development methods, are study methods used to determine the effectiveness of the product under consideration and to produce it. The simulation results show that stress, displacement and strain produce green and blue colors, it indicates that the retort basket and grill will not break or crack when used. As for the safety factor on the retort basket and grill produces a blue color which indicates that the retort basket and grill are very safe to use.

ABSTRAK

PT Banyuwangi Canenery Indonesia, yang berbasis di Banyuwangi, Indonesia, telah berkembang dan memenangkan banyak klien. Hingga saat ini, sektor pengalengan telah mengembangkan dan memperbarui infrastrukturnya. Panggangan dan keranjang retort dipasang di talang air oleh PT Banyuwangi Canenery Indonesia. R&D adalah istilah yang digunakan untuk menggambarkan salah satu pendekatan penelitian dan pengembangan. Penelitian dan pengembangan, juga dikenal sebagai metode penelitian dan pengembangan, adalah metode penelitian yang digunakan untuk menentukan keefektifan produk yang sedang dipertimbangkan dan untuk memproduksinya. Hasil simulasi didapatkan bahwa stress, displacement dan strain menghasilkan warna hijau dan biru, hal tersebut menunjukkan bahwa retort basket dan grill tidak akan patah atau retak pada saat digunakan. Sedangkan untuk faktor keamanan pada retort basket dan grill menghasilkan warna biru yang menunjukkan bahwa retort basket dan grill sangat aman untuk digunakan.

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INTRODUCTION

PT Banyuwangi Cannery Indonesia is a canned food production company such as canned sardines, canned mackerel, canned tuna, frozen fish (seafood), and fishmeal. Since the establishment of PT Banyuwangi Cannery Indonesia in 1995, the initiators and all skilled human resources at PT Banyuwangi Cannery Indonesia have always been persistent in offering their best products to the public, both domestically and abroad (Samudra et al., 2020). Located in Banyuwangi, Indonesia, PT Banyuwangi Cannery Indonesia continues to grow and gain a lot of trust from customers, and until now the canning factory has been expanded and enlarged its infrastructure. One of them is the addition of grills to the gutters and retort baskets at PT Banyuwangi Cannery Indonesia (Darma, 2022).

Gutters are a series of channels and important infrastructure to channel sewage or rainwater to be taken somewhere so that it does not become a problem for the environment and health (Hamimed et al., 2021). Wastewater management at PT Banyuwangi Cannery Indonesia, besides that, the grill ditch functions as a water catchment media where surface water seeps or enters the drain pipe / drainage channel, as well as the natural infiltration soil below. This makes the grill ditch an important component of the drainage system in the factory (Roso et al., 2020).

In addition to the gutters, PT Banyuwangi Cannery Indonesia also added a number of retort baskets that are used as product sterilization containers. Retort is a sterilization process using high temperature and pressure to eradicate microorganisms such as pathogenic bacteria and spoilage bacteria (Blickem et al., 2022). The sterilization process of food products that have been packaged in airtight packaging is usually in the form of cans, special glass cups, trays or pouches made of aluminum and certain plastic materials (Debeer et al., 2021). The sterilization process usually requires a temperature of about 121-131 degrees Celsius, for a certain time to kill microorganisms. Retort baskets are usually made of metal or other heat-resistant materials and are specially designed to withstand the high pressure and temperature required during the retort process (Raits et al., 2021). The design of the grill and retort basket is made based on several factors, namely cost factors and the shape of the grill and retort basket. It is expected that the grill and retort basket made can easily analyze durability and have an economical price (Jimenez et al., 2024).

One example of how technology can help humans work more efficiently and effectively is the Autodesk Inventor software, which is used to create prototypes by modeling 2D sketches into 3D models and thereby enhancing the understanding of the product's effectiveness. As a result, researchers are more likely to focus on the design of grills and retrofits using Autodesk Inventor software (Tickoo, 2019). Software was used to create a prototype pencacah robot by modeling a 2D object into a 3D object. In addition, software can also reduce prototype testing so that product effectiveness can be determined. Due to this, researchers are interested in studying the relationship between rancang bangun desain mesin grill and keranjang retort using Autodesk inventor software (Akbar et al., 2024).

RESEARCH METHODS

One method that is used in research and development is called R&D. Research and development, also known as study and development methods, are study methods used to determine the effectiveness of the product under consideration and to produce it. Researchers conduct research to gather a large amount of data required later on in the product development process as well as to conduct analysis and evaluation of the produced product (Fellows & Liu, 2021). The R&D methodology has tools that are useful for conducting research, such as grill and response testing and design basket retort based on Autodesk Inventor software. The following are the material specifications of the grill and retort basket.

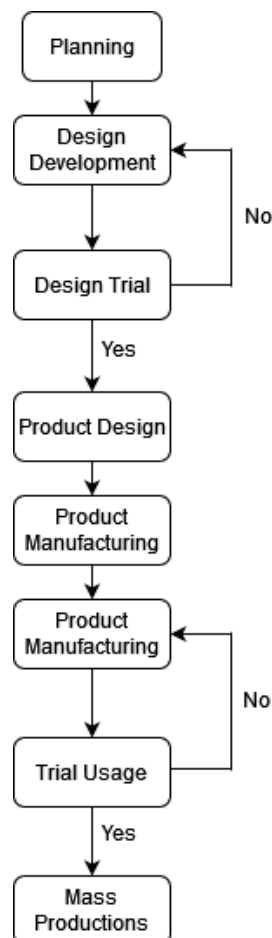
Table 1. Grill Material Specifications

Grill Material Specifications		
Name	Stainless Stell, 440C	
General	Mass Density	0,279986 lbmass/in ³
	Yield Strength	99931 psi
	Ultimate Tensile Strength	124914 psi
Stress	Young's Modulus	29979,3 ksi
	Poisson's Ratio	0,27 ul
	Shear Modulus	11802,9 ksi

Table 2. Retort Basket Material Specifications

Retort Basket Material Specifications		
Name	Iron, Cast	
General	Mass Density	0,25831 lbmass/in ³
	Yield Strength	109939 psi
	Ultimate Tensile Strength	128213 psi
Stress	Young's Modulus	17477 ksi
	Poisson's Ratio	0,3 ul
	Shear Modulus	6721,94 ksi

The steps involved in conducting research include identifying problems that arise from the study object, gathering data, and developing a design using Autodesk Inventor software so that it can be implemented in a building or prototype. The final step involves synthesizing the research findings (Zhao et al., 2020). Here are the stages of the research flow chart.


Figure 1. Research Flow Chart

RESULTS AND DISCUSSION

RESULT

The discussion in this chapter of retort and griel baskets is designed using Autodes Inventor 2022 software, this analysis is divided into four sections with each discussing the results of stress, strain, and safety factors. The force used on the retort basket is 1556 newtons and 889 newtons on the griel.

Stress Grill

The simulation results show that the maximum stress of 7.302 to -6.241 mpa can be seen in the following figure

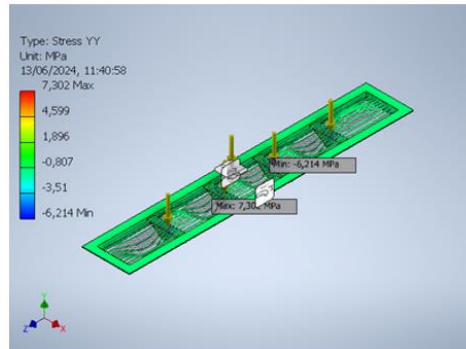


Figure 2. Stress Grill

Strain Grill

The strain values that occur are 4.733×10^{-5} ul to -5.508×10^{-5} ul. Strain that occurs can be seen in the following figure

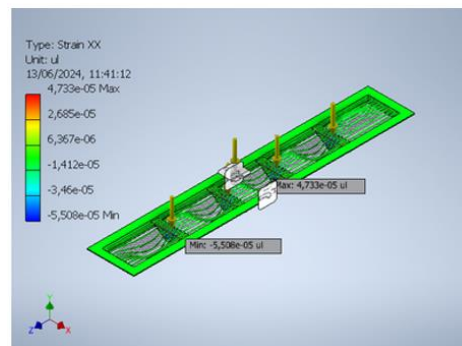


Figure 3. Strain Grill

Displacement Grill

The results of the displacement analysis simulation are 0.0159 mm to 0.03085 mm Where the results can be seen in the following figure

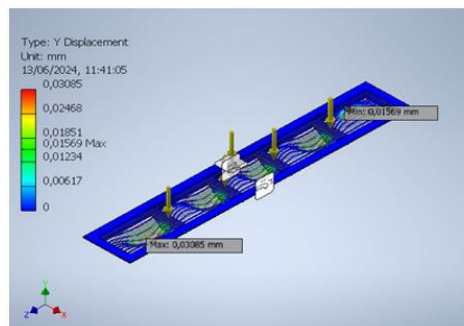


Figure 4. Displacement Grill

Safety Factor Grill

The simulation results show that the safety factor that occurs in griel is 15 safety factors so that it can be said that griel is safe to use.

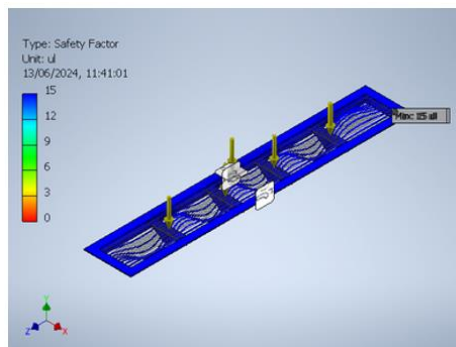


Figure 5. Safety Factor Grill

Stress Basket Retort

The simulation results show that the maximum stress of the retort basket is -118.6 Mpa to 160.2 Mpa. Stresses that occur can be seen in the following figure

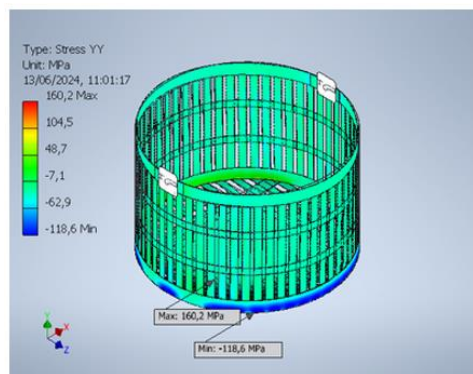


Figure 6. Stress Basket Retort

Strain Basket retort

The strain value that occurs is 0.002332 ul to 0.002339 ul. The strain that occurs can be seen in the following figure

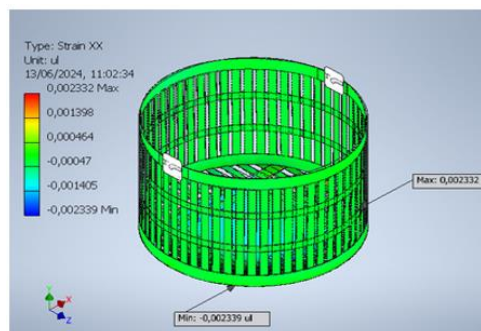


Figure 7. Strain Basket Retort

Displacement Basket retort

The results of the displacement analysis simulation are 0.02 mm to 33.88 mm where the results can be seen in the following figure

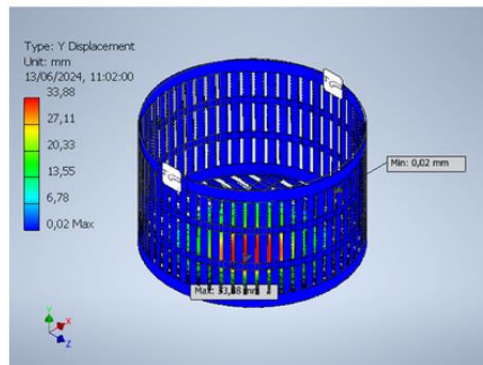


Figure 8. Displacement Basket Retort

Safety Factor Basket retort

The simulation results show that the safety factor that occurs in the retort basket frame occurs from 15 ul to 1.86 ul safety factor so that it can be said that the frame construction is safe to use. said to be very good.

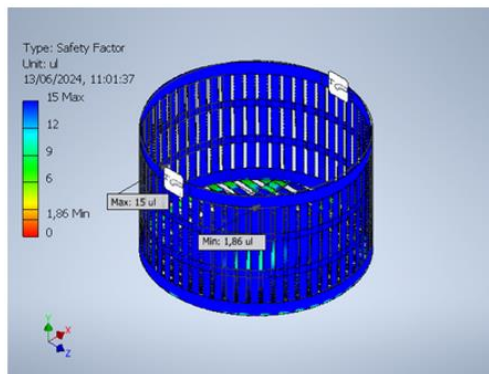


Figure 9. Safety Factor Basket Retort

The simulation results show that the retort basket experiences a stress of 118.6 mpa to 160.2 mpa, a displacement of 0.02 mm to 33.88 mm, a strain of 0.002332 ul to -0.002339 ul, and a factor of safety of 15 ul to 1.86 ul. While the grill experienced a stress of 7.302 to -6.241 mpa, a displacement of 0.0159 mm to 0.03085 mm, a strain of 4.733e-05 ul to -5.508e-05 ul, and a safety factor of 15 ul. From the simulation results, it is found that stress, displacement and strain produce green and blue colors, it indicates that the retort basket and grill will not break or crack during use. As for the safety factor on the retort basket and grill produces a blue color which indicates that the retort basket and grill are very safe to use. In the safety factor test, the blue color means that the test results have met the established safety standards (Shkut, 2023). The blue color indicates that the safety factor value has reached or exceeded the minimum value set such as a value of 3 which indicates that the component or structure is safe to use under the conditions tested (Gheorghe et al., 2023). Nilai safety factor minimal 3 menunjukkan bahwa hasil pengujian telah memenuhi standar keamanan yang ditetapkan. A safety factor value of at least 3 indicates that the test results have met the established safety standards. With this value, the design can be said to be production-ready and ready to be used in normal operation (Suryo, 2020).

CONCLUSION

The simulation results show that stress, displacement and strain produce green and blue colors, it indicates that the retort basket and grill will not break or crack when used. As for the safety factor on the retort basket and grill produces a blue color which indicates that the retort basket and grill are very safe to use.

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