# RINGKASAN

Prototipe alat pemasak mi shirataki yang digunakan di Pusat Riset Teknologi Tepat Guna (PRTTG) BRIN belum mampu menghasilkan waktu pemasakan yang optimal. Laju aliran air pemasak terlalu tinggi sehingga menyebabkan waktu kontak antara mi dan air panas (waktu tinggal) terlalu singkat sehingga mi belum matang sempurna dan kadar air melebihi standar. Penelitian ini bertujuan untuk: 1) Menguji kinerja prototipe alat pemasak mi shirataki PRTTG-BRIN; dan 2) Optimasi desain prototipe alat pemasak mi shirataki PRTTG-BRIN untuk pengembangan alat selanjutnya, dengan fokus pada waktu pemasakan mi.

Penelitian dilakukan di PRTTG-BRIN selama 6 bulan dan terdiri dari dua tahap utama: uji kinerja prototipe dan optimasi desain. Uji kinerja dilakukan dengan pengambilan data aktual: 1) laju aliran air, 2) waktu tinggal, 3) kadar air, 4) elongasi, 5) pH air, 6) konsumsi energi, dan 7) kapasitas produksi. Selanjutnya, dilakukan optimasi desain melalui tahapan 1) analisa data hasil pengujian, 2) perencanaan desain, 3) sketsa, 4) pemilihan material, 5) pemodelan prototipe, dan 6) simulasi. Simulasi dilakukan menggunakan *software solidworks* yang meliputi *flow simulation*, analisis tegangan, dan faktor keamanan (*safety factor*) untuk menentukan desain pipa dan rangka yang paling sesuai.

Hasil penelitian menunjukkan bahwa prototipe awal alat pemasak mi shirataki memiliki laju aliran rata-rata 0,03855 m/s dengan waktu tinggal mi hanya 52,8 s, yang masih jauh dari waktu tinggal ideal selama 5 menit. Oleh karena itu, dilakukan optimasi desain melalui *flow simulation* pada beberapa alternatif bentuk dan panjang pipa. Dari hasil simulasi, pipa belok dengan panjang 12.071 mm menghasilkan laju aliran 0,030 m/s dan waktu tinggal 402,4 s yang paling mendekati target desain. Selain itu, dilakukan simulasi tegangan terhadap 5 alternatif ukuran rangka. Berdasarkan hasil simulasi tersebut, desain alternatif rangka 2 dengan ukuran 2150 x 632 x 472 mm dipilih sebagai desain akhir karena menunjukkan kinerja struktur yang baik dan mampu menahan beban tanpa mengalami deformasi signifikan. Ukuran rangka ini juga dinilai paling sesuai dengan ukuran bak pemasak, sehingga mendukung keselarasan antar komponen alat secara keseluruhan. Rangka tersebut menggunakan material *hollow stainless steel* 316 dengan ukuran profil 40 x 60 mm, dan hasil simulasi *safety factor* menunjukkan nilai di atas 2 yang menandakan struktur cukup aman digunakan dalam operasional pengolahan mi shirataki.

## *SUMMARY*

*The prototype of the shirataki noodle cooker used at the Pusat Riset Teknologi Tepat Guna (PRTTG) – National Research and Innovation Agency (BRIN) has not yet achieved an optimal cooking time. The cooking water flow rate is too high, resulting in a short contact time (residence time) between the noodles and the hot water. Consequently, the noodles are not fully cooked, and their moisture content exceeds the acceptable standard. This research aims to: (1) evaluate the performance of the shirataki noodle cooker prototype developed by PRTTG-BRIN; and (2) optimize the prototype design for future development, with a particular focus on achieving optimal noodle cooking time.*

*The research was conducted at PRTTG-BRIN over a six-month period and consisted of two main stages: performance evaluation and design optimization. The performance evaluation involved the collection of actual data, including: (1) water flow rate, (2) residence time, (3) moisture content, (4) elongation, (5) water pH, (6) energy consumption, and (7) production capacity. Design optimization was carried out through the following stages: (1) analysis of performance test data, (2) design planning, (3) sketching, (4) material selection, (5) prototype modeling, and (6) simulation. Simulations were conducted using SolidWorks software, including flow simulation, stress analysis, and safety factor evaluation to determine the most suitable pipe and frame design.*

*The results indicate that the initial prototype had an average water flow rate of 0.03855 m/s, with a noodle residence time of only 52.8 seconds, significantly below the ideal target of 5 minutes. Therefore, design optimization was conducted through flow simulations of various pipe shapes and lengths. Among the tested designs, a curved pipe with a length of 12,565 mm produced a flow rate of 0,030 m/s and a residence time of 402,4 seconds, which closely approached the desired target.Additionally, stress simulations were carried out on five alternative frame sizes. Based on the simulation results, Frame Design 2, with dimensions of 2150 x 632 x 472 mm, was selected as the final design due to its superior structural performance and ability to withstand loads without significant deformation. This frame size was also considered the most compatible with the dimensions of the cooking tub, thereby ensuring overall alignment between the system components. The frame is constructed from 316 stainless steel with a 40 x 60 mm profile, and the simulation results showed a safety factor greater than 2, indicating that the structure is sufficiently safe for operational use in shirataki noodle processing.*