

## INTISARI

### STUDI EKSPERIMEN PENGARUH TEBAL *STACK* DAN PANJANG RESONATOR TERHADAP KINERJA *PRIME MOVER* TERMOAKUSTIK TIPE GELOMBANG BERDIRI UJUNG TERBUKA

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Telah dilakukan penelitian tentang pengaruh tebal *stack* dan panjang resonator terhadap kinerja *prime mover* termoaakustik tipe gelombang berdiri dengan ujung terbuka. Prinsip *prime mover* termoaakustik adalah memindahkan panas dari suhu tinggi ke suhu rendah dan menghasilkan usaha dalam bnetuk gelombang bunyi. *Prime mover* termoaakustik terdiri atas sebuah *heater*, pipa resonator, pendingin dan *stack*. *Stack* terbuat dari susunan rapat lembaran-lembaran kasa kawat baja antikarat (*wire mesh stainless steel*) ukuran #14 ( $r_{ef} = 0,275 \text{ mm}$ ) dengan variasi tebal *stack* 3 cm; 4 cm; 5 cm dan 6 cm. Pipa resonator terbuat dari *stainless steel* berdiameter 6,8 cm dengan variasi panjang resonator 105 cm; 130 cm; 155 cm; 180 cm dan 205 cm. Pipa resonator dengan panjang 105 cm dan tebal 3 cm menghasilkan suhu *onset* terendah dan waktu *onset* tersingkat masing-masing 151°C dan 105 s. Frekuensi yang dihasilkan tidak dipengaruhi dengan tebal *stack* namun dipengaruhi terhadap panjang resonator. Frekuensi bunyi tertinggi dihasilkan oleh pipa resonator 130 cm yaitu sebesar 199 Hz dengan orde tiga. Amplitudo yang dihasilkan dipengaruhi oleh tebal *stack* dan panjang rsonator. Amplitudo tekanan tertinggi dihasilkan oleh panjang pipa resonator 205 cm dengan tebal *stack* 3 cm msebesar 3,3 kPa.

Kata kunci : *prime mover*, termoaakustik, kedalaman penetrasi termal, kedalaman penetrasi viskos

## ABSTRACT

### ***EXPERIMENTAL STUDY OF THE EFFECT OF THE STACK THICKNESS AND RESONATOR LENGTH ON THE PERFORMANCE OF A STANDING WAVE THERMOACOUSTIC OPEN END PRIME MOVER***

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A research about influence of the stack thickness and resonator length towards performance of standing wave thermoacoustic open end prime mover has been done. The principle of thermoacoustic is to transfer the heat from high temperature to low temperature and produces a work in the form of sound waves. The thermoacoustic prime mover engine consists of heater, pipe resonator, cooler and stack. Stack was made of some arrangement of stainless wire mesh sheet by mesh of #14 ( $r_{ef} = 0,275 \text{ mm}$ ) with the variation of thickness 3 cm; 4 cm; 5 cm and 6 cm. Pipe resonator was made from stainless steel of 6,8 cm in diameter with resonator length variation of 105 cm; 130 cm; 155 cm; 180 cm dan 205 cm. Pipe resonator which have the length of 105 cm and stack 3 cm stack thickness, produce the lowest *onset* the temperature is 151°C and quickest *onset* time is 105 s. The generated frequency had been generated are not affected by stack thickness but is affected by resonator length. The highest frequency which had been generated by pipe resonator of 130 cm length is about 199 Hz at third order. The generated amplitude had been generated affected by stack thickness and resonator length. The highest amplitude had been generated by pipe resonator which have 205 cm length and 3 cm thick of stack.

Keywords : prime mover, thermoacoustic, depth of thermal penetration, depth of viscous penetration,