INTISARI

Metana merupakan salah satu gas reaktif, dalam beberapa penelitian metana dapat memicu terjadinya detonasi. Gelombang detonasi merupakan tipe gelombang pembakaran yang merambat dengan kecepatan dan tekanan tinggi yang berbahaya dan bersifat destruktif. Oleh karena itu pengendalian gelombang detonasi atau *detonation quenching* diperlukan untuk meningkatkan keselamatan dan keamanan pekerja maupun instalasi dalam sebuah industri. Salah satu metode *detonation quenching* yang populer adalah dengan menggunakan arrester sebagai *suppressant* fisik. Penelitian ini membahas tentang pengaruh variasi *blockage ratio* dan *initial pressure* terhadap karakteristik serta pola perambatan gelombang detonasi dibelakang model *arrester*. Pengujian *arrester* dilakukan dengan menggunakan pipa uji detonasi (PUD*)* yang memiliki panjang total 3100 mm dengan diameter dalam 50 mm. PUD dibagi menjadi 2 bagian utama, bagian pertama disebut *driver tube* yang didalamnya berisikan campuran hidrogen-oksigen dengan tekanan awal 100 Kpa. Bagian kedua disebut *driven tube,* berisikan gas uji detonasi dengan variasi tekanan sebesar 10 kPa hingga 100 kPa dengan interval 10 kPa. Pada *driven tube* terdapat *housing flame arrester* berisikan *arrester* dengan variasi *blockage ratio* sebesar 20,25 %; 30,6 %; dan 34,6 % yang berada di tengahnya. Berdasarkan pengujian dengan berbagai kondisi, diketahui bahwa terdapat dua pola peambatan gelombang pebakaran di belakang model arrester, yaitu *detonation quenching* dan *detoantion reinitiation*. Detonation quenching hanya terjadi pada tekanan awal 20 kPa dengan menggunakan arrester dengan blockage ratio sebesar 34,6 %; selain kondisi tersebut gelombang detonasi terbentuk kembali atau mengalami detonation reinitiation. Kenaikan tekanan awal akan memberikan pengaruh terhadap peningkatan tekanan dan kecepatan serta penurunan ukuran sel detonasi dan jarak reinisiasi, sedangkan peningkatan *blockage ratio* arrester memberikan pengaruh berupa penurunan tekanan dan kecepatan *combustion wave*, serta peningkatan jarak reinisiasi dan ukuran sel detonasi.

Kata kunci : detonasi, *blockage ratio*, *detonation quenching*, *detoantion reinitiation*

ABSTRACT

Methane is one of the reactive gas which in some studies has reported that methane could trigger a detonation wave. The detonation wave is a combustion wave propagated at supersonic velocity which is dangerous and destructive. Therefore, the control of detonation wave or detonation quenching is needed as an effort to improve the safety of workers and installations in an industry. One popular method of detonation quenching is to use arresters as physic suppressant. The aims of this experiment is to investigate the effect of blockage ratio and variation of an initial pressure on the characteristics and pattern of detonation wave propagation at the downstream of the arrester model. Experiments use a detonation test tube with total leght of 3100 mm and inner diameter of 50 mm. It is devided into two sections as driver section of 1000 mm in length and driven section of 2100 mm in length. The driver section contains a mixture of hydrogen-oxygen with a constant initial pressure of 100 kPa, and the driven tube section is filled with methane–oxygen mixture and methane–air mixture at an initial pressure from 10 kPa to 100 kPa with intervals of 10 kPa. A model of detonation arrester with variation of blockage ratio of 20,25%; 30,6%; and 34,6% was installed in the middle of driven tube section. Based on this experiment, at least two characteristics of detonation wave propagation could be observed at the downstream of the model of detonation arrester, detonation quenching and detonation reinitiation. The detonation quenching is only occured at an initial pressure of 20 kPa and using arrester model with a blockage ratio of 34,6 %, in addition to this condition the detonation waves were re-formed or referred to detonation reinitiation. The increase of initial pressure had an effect on increasing pressure and speed, as well as decreasing detonation cell size and reinitiation distance. On the other hand, increase of blockage ratio causes a decrease in pressure and velocity of the combustion wave, as well as an increase in reinitiation distance and detonation cell size.

Keywords : detonantion, blockage ratio, detonation quenching, detonantion reinitiation