THE EFFECTS OF CHANGES AT SIGNALIZED INTERSECTION ON THE VEHICLES EMISSION LOADING IN PARIT BUNTAR, PERAK.

By

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ABSTRACT

The transportation in Peninsular Malaysia includes public transport such as buses and trains and private transport such as motorcycles and cars. The emissions of Carbon Dioxide (CO_2) and Oxides of Sulphur (SO_X) vary directly with fuel consumption. The emissions of Carbon Monoxide (CO), Oxides Of Nitrogen (NO_X), Particulate Matter and Hydrocarbons vary in addition with the engine design, the air-to-fuel ratio, and vehicle operating characteristics, with an optimum speed usually in excess of 60 kilometres (km) per hour. At the signalized intersection, the amount of traffic emission are depend on the four mode elemental driving cycle consisting of cruise, acceleration, deceleration and idling time for specific traffic condition represented by traffic flow, traffic control and intersection geometry. The signalized intersection that designed according to the proper standard will minimize delay and optimize the junction capacity while the improper design geometry will increase the delay faced by road users. SIDRA Intersection 5.1 software was used in this study in order to investigate the vehicles emissions due to traffic volume and its delay time and the effect of traffic light junction's configuration during peak hour. There are six signalized intersection along the major road of Jalan Taiping and Jalan Abdul Raof in Parit Buntar will be investigated. The vehicles emission pollution that carried out for year 2010 were generated and compared with the current study in year 2011. Some improvement was proposed in this study in term of coordination between adjacent signal light controllers, left turn on red movement, providing proper signal phasing and signal time and minor geometrical modifications at the chosen signalized intersections. The result for each signalized intersection showed the significant reduction in the amount of vehicles emissions and average delay time. For signalized intersection between Jalan Taiping, Jalan Padang, and Jalan Lintang the percent of

reduction for fuel consumption, hydrocarbon, oxides of nitrogen and carbon dioxide approximately 42 % due to the reduction of delay time approximately 23% after the implementing minor geometry and signal phasing. Total fuel reduction for signalized intersection between Jalan Taiping and diversion from Shell petrol Station and signalized intersection between Jalan Abdul Raof and diversion Shell petrol Station showed the reduction in approximately 12% and 6% after the implementation of the signal time modification. Other than that, the reduction of fuel consumption at Jalan Taiping and Jalan perusahaan 17% after the implementation of the minor geometry and signal phasing modification. Lastly, reduction in fuel consumption and hydrocarbon more than 43 % compared to the hydrocarbon emissions in year 2010 at Jalan Taiping and Federal Route 1.

ABSTRAK

Pengangkutan utama di Semenanjung Malaysia terdiri daripada pengangkutan awam seperti bas dan kereta api dan pengangkutan persendirian seperti kereta dan motorsikal. Pembebasan karbon dioksida (CO_2) dan oksida sulfur(SO_X) berubah – ubah secara langsung dengan penggunaan bahan bakar. Pembebasan karbon monoksida (CO), oksida nitrogen (NO_X), zarahan halus dan hidrokarbon berubah-ubah berdasarkan reka cipta engin, nisbah udara ke bahan bakar, dan ciri – ciri operasi kenderaan dengan kelajuan optimum melebihi 60 Kilometer per jam. Di persimpangan bersignal, jumlah pembebasan pencemaran lalu lintas bergantung pada empat kitaran mod memandu yang terdiri daripada unsur berhenti dan menunggu di persimpangan lampu isyarat, pecutan, nyahpecutan halaju kenderaan, dan masa yang digunakan oleh kenderaan untuk tidak bergerak bagi keadaan lalulintas tertentu diwakili oleh arus lalu lintas dan geometri persimpangan. Simpang bersignal yang direka bentuk mengikut piawaian yang ditetapkan akan dapat meminumkan kelewatan dan mengoptimumkan kapasiti persimpangan sedangkan rekabentuk geometri yang tidak tepat akan meningkatkan kelewatan yang dihadapi oleh pengguna jalan raya. Dalam kajian ini terdapat enam simpang bersignal di sepanjang jalan utama iaitu Jalan Taiping dan Jalan Abdul Raof di Parit Buntar. Pembebasan pencemaran kenderaan yang terhasil untuk tahun 2010 akan dibandingkan dengan kajian semasa 2011. Beberapa penambaikan dicadangkan dalam kajian ini seperti koordinasi antara kawalan isyarat yang baik, pergerakan pusing ke kiri semasa lampu merah, menyediakan masa isyarat dan dan fasa isyarat yang betul dan sedikit penambaikan dari segi geometri persimpangan bagi persimpangan bersignal yang dikaji. Keputusan untuk setiap persimpangan bersignal menunjukkan penurunan yang signifikan bagi jumlah pembebasan

pencemaran kenderaan dan kelewatan waktu. Untuk persimpangan bersignal antara Jalan Taiping, Jalan Padang dan Jalan Lintang peratus pengurangan untuk penggunaan bahan bakar, hidrokarbon, nitrogen oksida dan karbon dioksida sekitar 42% dan pengurangan masa kelewatan mencapai sekitar 23% setelah berlakunya perubahan minor geometri dan fasa isyarat. Jumlah pengurangan bahan bakar untuk persimpangan Jalan Taiping dan lencongan dari Stesen Minyak Shell dan persimpangan bersignal antara Jalan Abdul Raof dan lencongan daripada Stesen Minyak Shell menunjukkan pengurangan menghampiri 12% dan 6% selepas penambaikan perubahan pada fasa isyarat. Selain itu, pengurangan penggunaan bahan bakar di Jalan Taiping dan Jalan Perusahaan mencapai kepada 17% selepas penambaikan minor untuk geometri dan perubahan fasa isyarat. Akhir sekali, di persimpangan Jalan Taiping dan Jalan Persekutuan Utama, pengurangan terhadap penggunaan bahan bakar dan hydrocarbon adalah melebihi 43% berbanding pada tahun 2010.

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