

PREDICTION OF GROUND LEVEL OZONE EXCEEDENCES AND RETURN
PERIOD USING DISTRIBUTION FUNCTION

By
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A PITA report submitted in partial fulfilment of
the requirements for the award of the degree of
Bachelor of Technology (Environment)

SCHOOL OF OCEAN ENGINEERING
UNIVERSITI MALAYSIA TERENGGANU
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**SCHOOL OF OCEAN ENGINEERING
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VERIFICATION AND APPROVAL FORM

This PITA research report entitled Prediction of ground level ozone exceedences and return period using distribution function prepared and submitted by Phon Mun Yee, Matric No. UK 29558 in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology (Environment) has been examined and is recommended for approval of acceptance.

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DECLARATION

I hereby declare that this PITA research report entitled *Prediction of ground level ozone exceedences and return period using distribution function* is the result of my own research except as cited in the references.

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ABSTRACT

Ozone (O_3) is considered as one of the crucial air pollutant in atmosphere which affects human health, vegetation and forests. According to DoE, the annual average daily maximum one-hour ozone concentrations had slightly increased in 2014 compared to 2013. Thence, it is crucial to come out with a model that is suitable to predict ground level ozone concentration in order to prevent adverse air pollution effects to be aggravated. Therefore, the aim of this study is to predict ground level ozone exceedences and return period at Cheras, Kuala Lumpur and Tanjung Malim, Perak using distribution function. Data analysis in this study was done by MATLAB. The selected distribution functions to fit O_3 concentration data in 2012 are Gamma, Inverse Gaussian/ Wald and Rayleigh. Next, parameter for each distribution was estimated by Maximum Likelihood Estimator (MLE) method. The best fit distribution was determined by the selected performance indicators based on the highest accuracy measures which are close to 1 and the smallest error measures which are close to 0. Results showed that the best distribution that fits the O_3 observations was found to be Gamma distribution for Cheras and Tanjung Malim. The probabilities of exceedences were calculated and predicted the return period by the cumulative density function (*cdf*) obtained from the best-fit distribution. For Cheras, it was predicted to exceed 0.1ppm for 6.7 days with a return period of once per 55 days. Tanjung Malim was predicted to exceed 0.1ppm for 3.6 days with a return period of once per 101 days. In Malaysia, modelling using distribution function is still a new approach and it is believe that it will be a good alternative for ground level ozone prediction.

RAMALAN KEPEKATAN OZON MELEBIHI HAD PIAWAIAN DAN MASA PULANGAN DENGAN FUNGSI TABURAN

ABSTRAK

Ozon (O_3) merupakan salah satu pencemar udara utama dalam atmosfera yang menjejaskan kesihatan manusia, tumbuh-tumbuhan dan hutan. Menurut JAS, kepekatan purata tahunan kepekatan maksimum harian ozon pada tahun 2014 telah menunjukkan sedikit peningkatan berbanding tahun 2013. Oleh sedemikian, ia adalah penting untuk menghasilkan satu model yang sesuai untuk meramalkan kepekatan ozon permukaan bumi supaya dapat mengelakkan kesan-kesan pencemaran udara untuk menjadi semakin teruk. Oleh itu, tujuan kajian ini adalah untuk meramalkan kepekatan ozon permukaan bumi yang melebihi had piawaian dan masa pulangan di Cheras, Kuala Lumpur dan Tanjung Malim, Perak dengan menggunakan fungsi taburan. Analisis data dalam kajian ini dilakukan dengan MATLAB. Fungsi taburan yang terpilih untuk menyesuaikan data kepekatan O_3 pada tahun 2012 adalah *Gamma*, *Inverse Gaussian/ Wald* dan *Rayleigh*. Anggaran parameter untuk ketiga-tiga taburan diperolehi dengan kaedah *Maximum Likelihood Estimator* (MLE). Taburan terbaik adalah ditentukan oleh petunjuk prestasi yang terpilih berdasar dengan pengukur ketepatan dekat kepada nilai 1 dan pengukur keralatan dekat kepada nilai 0. Menurut keputusan yang didapati, taburan terbaik yang sesuai dengan data O_3 di Cheras dan Tanjung Malim adalah *Gamma*. Kebarangkalian kepekatan O_3 melebihi had piawaian dan masa pulangan diramal dengan cumulative density function (*cdf*) oleh taburan terbaik yang didapati dahulunya. Cheras diramalkan akan melebihi 0.1ppm sebanyak 6.7 hari dengan masa pulangan sekali setiap 55 hari. Tanjung Malim diramal untuk melebihi 0.1ppm sebanyak 3.6 hari dengan masa pulangan sekali setiap 101 hari. Model menggunakan fungsi taburan di Malaysia merupakan satu pendekatan baru dan ia dipercayai akan menjadi alternatif yang baik untuk ramalan kepekatan ozon permukaan bumi.