DISPERSION OF PARTICULATE MATTER FROM PALM OIL REFINERY MILL

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DISPERSION OF PARTICUALTE MATTER FROM PALM OIL REFINERY MILL

By

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Faculty : Engineering

The appearance of industrial emissions and the degradation of scenic vistas are two characteristics of air pollution that humans object. Reduction in visibility suggests worsening pollution levels. Visibility is characterized by either its visual range, or by opacity. The emissions from mobile source and stationary source are the major source of air pollutions contribution in Malaysia. Suspended particulate matter (SPM) and nitrogen dioxide (NO_2) are the predominant pollutants from these two sources exhaust smokes. Increasing the amounts of combustion product, gases carbon dioxide (CO_2) in the atmosphere also create an effect of blanket layer to increase retention of particulate matter and vapour near the earth before releasing to the space. The consequence of increasing the concentration, the particulate matter dissolves with vapour and grows into droplets when the humidity exceeds approximately 70%. The saturated particulate

matter acts as nuclei to scatter sun rays that will impair visibility and causing opaque situation know as haze.

The study of dispersion particulate matter from palm oil mill serves as a purpose of modeling the transport of particulate matter for obtaining permits and prevention of significant deterioration (PSD) to the environment. Gaussian Plume Model from a point source, subject to various atmospheric conditions is used to calculate particulate matter concentration then display the distribution of plume dispersion using geographic information system (GIS). Mixing height is determined to forecast potential haze occurrence. Dispersion of particulate matter from palm oil mill is following Gaussian Model and its concentration is normally distributed. The calculated particulate matter concentration is evaluated using Transilient Matrix function. Atmospheric Stability, mixing height, wind direction, wind speed, natural and artificial features play an important role in dispersion process. High concentration area exhibits immediately under prevailing wind direction.

Abstrak tesis yang dikemukakan kepada Senat Universisti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PENYEBARAN PARTIKULAT DARI KILANG PEMPROSESAN MINYAK KELAPA SAWIT

Oleh

WONG LEE ING

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Pengerusi : Profesor Madya Sa'ari bin Mustapha, PhD

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Kemunculan industri yang mengeluarkan wasap dan mendegrasikan pandangan kawasan berpemandangan indah telah menjadi dua ciri tumpuan manusia terhadap pencemaran udara. Pengurangan darjah penglihatan menandakan semakin bertambah buruk tahap pencemaran udara. Darjah penglihatan dicirikan dengan mengukur kedua-dua jarak penglihatan dan kekaburan udara sesuatu tempat itu. Pengeluaran jenis punca bergerak dan punca pegun adalah sumbangan utama punca pencemaran udara di Malaysia. Partikulat terampai dan gas Nitrogen Dioksida adalah bahan pencemar udara yang terlepas dari asap ekzos kedua-dua jenis punca tersebut. Penambahan jumlah hasil pembakaran, gas karbon dioksida di dalam atmosfera juga menimbulkan kesan litupan lapisan yang akan menahan partikulat dan wap supaya berada dekat dengan bumi sebelum dilepaskan ke angkasa lepas. Akibat daripada penambahan kepekatan,

partikulat melenyapkan diri dengan wap dan menjadi titisan apabila kelembapan melebihi kira-kira 70%. Partikulat tepu bertindak sebagai nukleus untuk menyelerakkan sinar matahari yang seterusnya mengurangkan darjah penglihatan dan menyebabkan keadaan kabur yang diketahui sebagai jelebu.

Kajian terhadap penyebaran partikulat dari kilang kelapa sawit, digunakan sebagai tujuan permodelan pengangkutan partikulat bagi memperolehi surat kebenaran dan juga mencegah kemerosotan ketara ke atas alam sekitar. Model Kepulan Gaussian jenis punca titik yang tertakluk pada pelbagai keadaan atmosfera; akan digunakan untuk mengira kepekatan partikulat dan keputusan ditunjukkan dalam bentuk taburan penyebaran kepulan dengan memakai system maklumat geografi. Kemuncak bercampur akan ditentukan untuk meramal kemungkinan berlakunya jelebu. Penyebaran partikulat dari kilang kelapa sawit adalah mengikuti Model Gaussian dan kepekatannya adalah taburan normal. Kepekatan partikulat yang terhitung akan dinilai dengan menggunakan Fungsi Peralihan Matrik. Kestabilan atmosfera, kemuncak bercampur, arah angin, kelajuan angin, alam semula jadi dan alam secara buatan memainkan peranan penting dalam proses penyebaran. Kawasan berkepekatan tinggi wujud betul-betul di bawah arah angin yang lazim bertiup.

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Weather occurs at all altitudes within troposphere; the surface analysis chart often cannot solely explain the weather, even weather occurring at or near the surface. (Lankford, 2000) Thus challenge by challenge has been taken for accuracy forecast to minimize and prevent natural disaster.

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I certify that an Examination Committee has met on 23 February 2006 to conduct the final examination of Wong Lee Ing on her Master of Science thesis entitled "Dispersion of Particulate Matter from Palm Oil Refinery Mill" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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This thesis submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of requirements for the degree of Master Science. The members of the Supervisory Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for equations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

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WONG LEE ING

Date:

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