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Particulate Matter in the Cafeterias in Naresuan University, Phitsanulok Province, Lower Northern Part of Thailand

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The objective of this research aims to study the particulate matter size smaller than 10 micron (PM10) in the cafeterias in Naresuan University. The study was carried out by measuring the average 8 hours of PM10. The result show that the average PM10 concentrations of 8 hour are in the range of 49.0 to 294.1 μg/m3. The 16 percentage of number of samples is higher than the national standard of PM10 in workplace of 8 hours at150 μg/m^3. Many factors that affect the amount of PM10 in the cafeteria are cooking processing, including of the number of people using the cafeteria and their activities.

Keywords: PM10, Cafeterias

1. INTRODUCTION

Phitsanulok municipality is located in the lower part of northern Thailand. It accommodates about one hundred thousand populations in the area of 18.26 km^2. Many activities such as traffic, industrial, agricultural, building, commercial, and others were considered as main sources of Particulate Matter (PM) including those having sizes smaller than 10 micron (PM10). There are report indicated that the quantity of roadside PM10 samples was higher than the Thailand National Ambient Air Quality Standards (NAAQS) for 24-hr average concentration of PM10 = 120 μg/m^3.[1]

Naresuan University emphasizes the improvement of educational opportunity and equity for all as one of the top government university in Thailand. A strong focus is placed upon research, innovation, partnership, and internationalization. Naresuan University aspires to be the University of Innovation. It is strategically located at the heart of the Thai Kingdom, Phitsanolok province, the major city of the lower northern region. Naresuan University comprises 16 faculties, 3 schools, 1 college, and 1 institute.

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The population in the university is amount 30,000 people in an area of 2 square meters.[2] There are fourteen cafeterias in this university. In the cafeteria, there are many activities in the kitchens and food shops. Food cooks is the main sources of air borne cooking.[3] Investigations of sources[4] chemical mass balance calculations[5] show the emissions from meat charbroiling and frying account for about 20% of all fine particulate organic matter or approximately 7% of total particle mass released into the atmosphere in Los Angeles. Most of the particles emitted from meat charbroiling contain organic compounds.[6-7] and the emissions depend strongly on the cooking method and food ingredients.[8] The past research that the average total dust concentration of 24 hour are in the range of 0.04 to 0.17 μg/m3 for both of air sample from cafeteria and food court around Khon Kaen University, Kon Kaen Province, set in east northern part of Thailand. This research is aims to study the total amount of particulate matter size smaller than 10 micron (PM10) in the cafeterias in Naresuan University. The particles samples collected in the both of cooking zone

2. METHODOLOGY

Sampling Sites: Samples were collected from cooking rooms and eating rooms in five cafeterias located in Naresuan University, central Phitsanulok. Site-1 is at Naresuan University square (NU Square) that is the cafeteria of the dormitory university (Fig. 1). Site-2 is at the cafeteria of faculty of engineering namely Pairin restaurant. (Fig.2). Site-3 is at the cafeteria of faculty of medicine namely MD site. (Fig.3). Site-4 is the cafeteria of general instruction building namely QS site. (Fig.4). Site-5 is cafeteria of Naresuan University hospital site. (Fig.5).

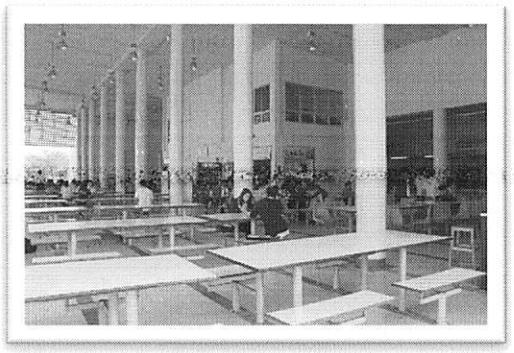

Fig. 1 Cafeteria of dormitory University square

Fig. 2 Cafeteria of faculty of engineering

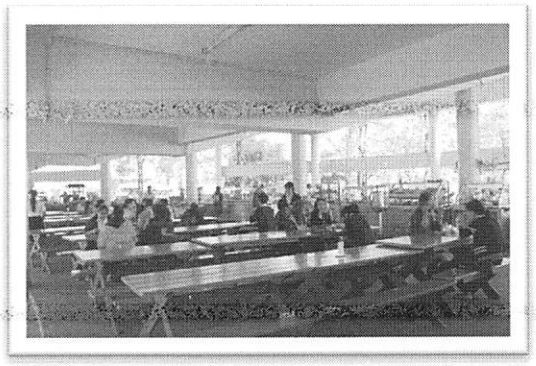

Fig. 3 Cafeteria of faculty of medicine

Fig. 4 Cafeteria of general intrusion building

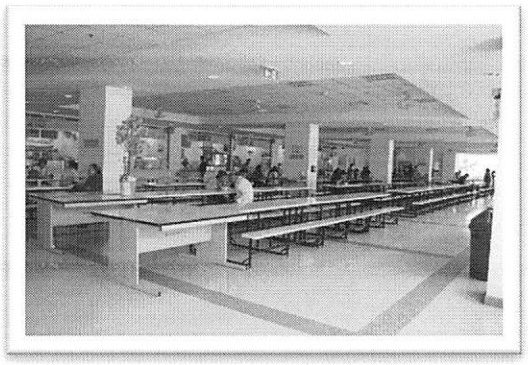

Fig. 5 Cafeteria of Naresuan University Hospital

Sampling Method: Samplings of indoor air particulate matter (PM10) were taken in five cafeterias on six days (Monday to Saturday). At all sites, air samples were taken 8 hour using low volume air samplers with flow rate of 1.7 liters per minute. (Fig.6) Glass filters with diameter of 37 mm were used as a means to collect the PM10 samples. Sampling sites are both in food cooking area and eating area. There are 6 samples in each cafeteria that total of samples is 60. The samplings period are in January 2014 to April 2014.

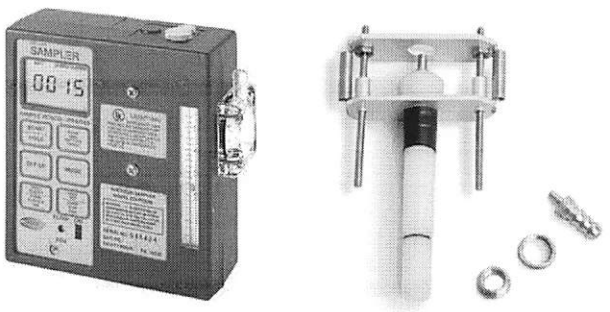

Fig 6 Low volume air samplers and PM10 inlet