

Analysis of the Drinking Water Quality in KhonKaen University.

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Study on water quality provided at KhonKaen University Services Centers. Various parameters under study were physical properties such as pH and turbidity, chemical properties such as total solid and residual chloride and of biological properties such as total coliform bacteria and faecal coliform bacteria. Six water samples were collected from six water sampling sites, each sample was taken from Food and Services Rongchai Site 1 and Site 2, Food and Services Complex Site 1 and Faculty of Medicine Cafeteria Site 1, Site 2 and Site 3. Results of this study physical and chemical which was within range of standard value for drinking showed mean value of pH for all water samples from all collecting Sites was 6.89; turbidity values were in the range of 0.96 to 1.25 NTU; total solid was found in the range of 32 to 170 mg/ml; whereas residual chloride values were in the range of 17 to 44 mg/liter. Values for physical and chemical properties showed well within the standard value for drinking water. However the results for biological parameters are not suitable for drinking as their total coliform bacteria and faecal coliform bacteria are higher than allow limit of <3 MPN/100 ml. Those water samples were from Food and Services Rongchai Site 1 and Site 2 with total coliform bacteria of 3 and 4 MPM/100 ml and faecal coliform bacteria of 4 and <3 MPN/100 ml respectively; whereas for Food and Services Complex Site 1 with total coliform bacteria of 127.5 MPM/100 ml and faecal coliform bacteria of 12 MPN/100 ml respectively; as for Faculty of Medicine Cafeteria Site 2 showed to have total coliform bacteria of 4 MPN/100 ml.

Key word : Drinking Water Quality

Assessment of Water Quality in East and West Si-Tan Water Reservoir at KhonKaen University.

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The assessment of water quality in East and West Si-Tan water reservoir at KhonKaen University. Studying of physical and chemical properties of water quality by examining nine parameters, color, odor, temperature, acid-alkaline (pH), Electric conductivity (EC) , Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Ammonia-Nitrogen (NH₃-N) and Nitrate-Nitrogen (NO₃-N) were used as indicators. Water was collected from 3points in each reservoir at interval of 2 times during August – September 2009. The results showed that the mean value for most of physical and chemicalproperties were not different while the mean value of Electric conductivity in the East and the West has an average of 817.3, 118.7 μ s/cm, respectively, and the mean value of DOwere 5.46, 7.36 mg/L, respectively. Comparison of DO and BOD values from previous studies 2003, 2007, 2009 showed the average DO in the East was 5.99, 5.81, 5.21 mg/L, respectively, However the average DO in the West was 8.28, 6.3, 7.36 mg/L, respectively, and BOD in the West had an average of 4.06, 5.44, 9.25 mg/L, respectively.However findings of the average BOD in the West was 10.08, 7.6, 9.97 mg/L, respectively.These data showed that the water quality in the East Si-Tan water reservoir is better than the West.

Key word : Water Quality

Comparison filter material between sand and rice husk ash for filtering filamentous form algae in effluent from Khon Kean Brewery Co., Ltd.

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The aim of this research was to investigate comparison filter material between sand and rice husk ash for filtering filamentous form algae in effluent from Khon Kean Brewery Co., Ltd on period June to July, 2011. This study focused on suspended solid quantity, filamentous form algae quantity and flow rate were experiment by 3 samples (effluent, filtered by sand and filtered by rice husk ash). The result showed that the average suspended solid quantity of effluent, filtered by sand and filtered by rice husk ash were 50.9, 36.4 and 39.3 mg /L, respectively. The average filamentous form algae quantity of above- mentioned samples were 19,040 , 7,040 and 5,640 filaments per 2 litres, respectively as well as the average flow rate of filtered by sand and filtered by rice husk ash was 50.7 and 145.3 cm³/minute. Comparison effluent when passed filtration differences filter material on suspended solid quantity, filamentous form algae quantity and flow rate found that sand filter could decrease suspended solid quantity higher than rice husk ash filter statistics significantly ($p < 0.05$). The average of filamentous form algae quantity showed that the both not differently and flow rate of rice husk ash faster than flow rate of sand statistics significantly ($p < 0.0001$).

Key word : Filter Material

Drinking water quality of some parameters in the water vending machine located at dormitories around Khon Kaen University.

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The objective of this study was to investigate drinking water quality in physical water quality in pH meter and the turbidity, the chemical quality in total solids and the amount of chloride and biological quality in total coliform bacteria and fecal coliform bacteria. The study was taken in June 2011 from 5 Water Vending Machines which has the same brand and model located around Khon Kaen University dormitory. The water vending machine located at Milinhouse dormitory, Peamsuk dormitory, Glodemview-ingmor dormitory, Banrow-resort dormitory and Pimancondo dormitory.

The result of this study in physical showed that pH of water samples from 5 locations were in the range of 7.19 to 7.42 ; turbidity values were in the range of 0.030 to 0.047 SSU. The chemical analysis showed that total solid values were in the range of 46.58 to 231 mg/liter ; whereas residual chloride values were in the range of 9.04 to 20.21 mg/liter. However, the results for biological parameter showed that the total coliform bacteria and fecal coliform bacteria were undetected which were in the standard of drinking water quality not more than 2.2 MPN/100 ml. According to the study can be summarized that pH value, turbidity, total solids, chloride, total coliform bacteria and fecal coliform bacteria of water samples from 5 water vending machine located at dormitories around Khon Kaen University dormitories are within the standard value for drinking water.

Key word : Drinking water quality, Water Vending Machine

Efficient treatment for Domestic Waste Water by the Floating Plants. (Water Hyacinth and Water Mimosa).

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Efficient treatment for domestic waste water by the floating plants using water hyacinth and water mimosa under natural condition using confined space of enameled basin with the area of 2,042 square centimeters. Which water hyacinth and water mimosa for treat the water from 2 places for example, the water from Plastic pond and the waste water treatment system in KhonKaen University. Which the aquatic plant appeared enameled kind basin vacates 6 the enameled basin of source of each water total up 12 the enameled basin for compare with aquatic plant bilateral kind efficiency in each water before and the back use the aquatic plant treat. The parameters of water quality were water temperature, acid alkaline(pH), impurity of the water (Biochemical Oxygen Demand, BOD) and organic nitrogen in the water for 4 week. The results showed the water quality from Plastic pond in KhonKaen University after being treated by using the water hyacinth and water mimosaeffective reduced numerous parameters such as reduced water temperature, organic nitrogen in the water (with values of 9.49 % and 98.85% respectively).While the values of pH and BOD were reduced by 25.11% and 70.58 % respectively. In the case of the water from the waste water treatment pond in KhonKaen University, after using the water hyacinth treatment effectively reduced the value of water temperature by 3 °C (9.84%), the value of pH was reduced by 3.55 (33.61 %), the value of BOD was reduced by 22.39 mg/l (76.24 %) and the value of organic nitrogen was reduced by 28 mg/l (99.01 %). The effectiveness of water mimosa treatment could reduced the value of water temperature by 3 °C (9.84%), the value of pH was reduced by 3.39 (29.36 %), the value of BOD was reduced by 13.91 mg/l (75.55 %) and the value of organic nitrogen was reduced by 27.93 mg/l (98.76 %). From using aquatic plant bilateral data treatment of the water from 2 places. Water hyacinth was more effective in water remediation than that form the treatment of water mimosa.

Key word : Domestic Waste Water

Fuel block from rice husk, water hyacinth and cattail.

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Studying the possibility of using rice husk, water-hyacinth and cattail to produce fuel block. The briquetting was non-heating hydrolic process, reinforced with cassava starch glue as binding agent. Two treatments were employed in this study. The ratio of starch to water to be 1:15 and the ratio of starch to water to be 1:30 This study included percentage moisture value, percent ash, heat value. Simple burning test of fuel blocks revealed data acquired through the ratio of starch to water to be 1:15 process with superior quality, lower moisture content, lower ash, as compare to the ratio of starch to water to be 1:30 process. Data analysis showed best binding agent ratio at 1:15 (starch:water). However, the heat value was higher from fuel block by the ratio of starch to water to be 1:30 process when compared to that from the ratio of starch to water to be 1:15 process, with binding ratio of 0.5:15 (starch:water). With regard to percentage moisture content in the First Data Set revealed first three ranking position with binding agent of 1:2 ratio were the fuel block obtained from rice husk in first place, followed by cattail and water-hyacinth ; with percent moisture content of 32.96%, 34.22% and 36.18% respectively. Percent ash found in fuel block by three consecutive order with binding agent ratio of 1:1 were from rice husk, rice-husk mixed with water-hyacinth and rice-husk with binding agent of 1:2; were 10.56%, 22.18% and 24.11% respectively. Second Data Set deal with heat value ranking in three consecutive order with binding agent ratio of 1:2 were as following: rice-husk mixed with water-hyacinth , cattail mixed with water-hyacinth and cattail mixed with rice-husk showed heat value of 5,131.49 kcal / kg 4,883.48 kcal / kg 4,877.85 kcal / kg respectively. However, the ratio of materials to binding agent haven' t difference. For burning test of fuel block in both treatments gave equally good results. However, the best materials for making fuel block, giving good burning quality with low smoke emission are ranking as following: water-hyacinth , rice-husk mixed with water-hyacinth and rice-husk respectively.

Key word : Fuel block

Impact of tourism activities to water quality at TapaeBangsaen 2 Ubonrat dam, Khonkaen Province.

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This study was impact of tourism activities to water quality at TapaeBangsaen 2Ubonrat dam, Khonkaen province by exploration and sampling of water 3 points that was TapaeBangsaen 2 area, distance from Tapae 50 meters and 100 meters. The samples of water were collected for analysis before and after Songkran festival. Water quality parameters were measured; temperature, pH, dissolved oxygen, biochemical oxygen demand, turbidity, total suspended solids and total dissolved solids. The study found that before Songkran festival had 3,200 tourists per day and most of them prefer to had the activities were eating and swimming at TapaeBangsaen 2 than elsewhere.The parameters at Tapae area were 28 °C, 10.75, 7.98 mg/l., 3.11 mg/l., 8.93 NTU, 52 mg/l. and 101.33 mg/l., respectively. Distance from Tapae 50 meters were 27.87 °C, 12.24, 8.15 mg/l., 1.73 mg/l., 1.8 NTU, 5.33 mg/l. and 98 mg/l., respectively. Distance from Tapae 100 meters were 27.2 ° C, 11.94, 8.41 mg/l., 1.32 mg/l., 1.97 NTU, 4 mg/l. and 94 m/l., respectively. Values of this parameters found that the most of excess water quality standard for surface in type2 except for dissolved oxygen.After Songkran festival had 16,716 tourists per day and the activities were same as before. Distance from Tapae 50 meters, the tourists had swimming with rubber rings and riding water cycle while distance from Tapae 100 meters, playing banana boats. The parameters at Tapae area were 29.5 °C, 10.08, 7.61 mg/l., 3.48 mg/l., 26.17 NTU, 92.67 mg/l. and 115.33 mg/l., respectively. Distance from Tapae 50 meters were 29.7 °C., 10.23, 7.77 mg/l., 3.47 mg/l., 15.93 NTU, 6 mg/l. and 110.67 mg/l., respectively. Distance from Tapae 100 meters were 29.53 °C, 9.98, 8.09 mg/l, 2.87 mg/l., 1.93 NTU, 6 mg/l. and 103.33 mg/l., respectively. The result of this study showed that the water quality after the Songkran festival was dirty as it had been affected by tourist activities.

Key word : Water Quality, Impact of Tourism Activities

Impact of tourism activities to water quality at TapaeBangsaen2 Ubonrat dam, Khonkaen

Province

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This study was impact of tourism activities to water quality at TapaeBangsaen 2Ubonrat dam, Khonkaen province by exploration and sampling of water 3 points that was TapaeBangsaen 2 area, distance from Tapae 50 meters and 100 meters. The samples of water were collected for analysis before and after Songkran festival. Water quality parameters were measured; temperature, pH, dissolved oxygen, biochemical oxygen demand, turbidity, total suspended solids and total dissolved solids. The study found that before Songkran festival had 3,200 tourists per day and most of them prefer to had the activities were eating and swimming at TapaeBangsaen 2 than elsewhere. The parameters at Tapae area were 28 °C, 10.75, 7.98 mg/l., 3.11 mg/l., 8.93 NTU, 52 mg/l. and 101.33 mg/l., respectively. Distance from Tapae 50 meters were 27.87 °C, 12.24, 8.15 mg/l., 1.73 mg/l., 1.8 NTU, 5.33 mg/l. and 98 mg/l., respectively. Distance from Tapae 100 meters were 27.2 ° C, 11.94, 8.41 mg/l., 1.32 mg/l., 1.97 NTU, 4 mg/l. and 94 m/l., respectively. Values of this parameters found that the most of excess water quality standard for surface in type2 except for dissolved oxygen.After Songkran festival had 16,716 tourists per day and the activities were same as before. Distance from Tapae 50 meters, the tourists had swimming with rubber rings and riding water cycle while distance from Tapae 100 meters, playing banana boats. The parameters at Tapae area were 29.5 °C, 10.08, 7.61 mg/l., 3.48 mg/l., 26.17 NTU, 92.67 mg/l. and 115.33 mg/l., respectively. Distance from Tapae 50 meters were 29.7 °C., 10.23, 7.77 mg/l., 3.47 mg/l., 15.93 NTU, 6 mg/l. and 110.67 mg/l., respectively. Distance from Tapae 100 meters were 29.53 °C, 9.98, 8.09 mg/l, 2.87 mg/l., 1.93 NTU, 6 mg/l. and 103.33 mg/l., respectively. The result of this study showed that the water quality after the Songkran festival was dirty as it had been affected by tourist activities.

ผลกระทบจากการท่องเที่ยวต่อคุณภาพน้ำบริเวณท่าแพบางแสน2 เขื่อนอุบลรัตน์ จังหวัดขอนแก่น

นักศึกษา : นางสาวสินจัย เมืองพิล รหัสประจำตัวนักศึกษา 513020361-3

อาจารย์ที่ปรึกษาโครงการวิจัย: อ.ดร.ลำไยณิรัตน์พันธุ์

ภาควิชาวิทยาศาสตร์สิ่งแวดล้อมคณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น

การศึกษาผลกระทบจากการท่องเที่ยวต่อคุณภาพน้ำบริเวณท่าแพบางแสน2 เขื่อนอุบลรัตน์ จังหวัดขอนแก่น โดยการสำรวจและเก็บตัวอย่างน้ำจำนวน 3 จุด คือ บริเวณท่าแพบางแสน2, ห่างจากท่าแพ 50 เมตร และห่างจากท่าแพ 100 เมตร ซึ่งแบ่งการเก็บตัวอย่างน้ำเพื่อการวิเคราะห์คุณภาพก่อนและหลังเทศกาลสงกรานต์ พารามิเตอร์ที่ทำการตรวจวัดคุณภาพน้ำ ได้แก่ อุณหภูมิ, ความเป็นกรด-ด่าง, ออกซิเจนละลาย, บีโอดี, ความขุ่น, ของแข็งแขวนลอยทั้งหมดและของแข็งละลายทั้งหมด ผลการศึกษาพบว่า ก่อนเทศกาลสงกรานต์มีนักท่องเที่ยวเดินทางมาเที่ยวประมาณ 3,200 คนต่อวัน นักท่องเที่ยวนิยมมานั่งรับประทานอาหารและเล่นน้ำบริเวณท่าแพมากกว่าจุดอื่น โดยค่าพารามิเตอร์ที่ทำการตรวจวัดบริเวณท่าแพ คือ 28 °C, 10.75, 7.98 มก./ล., 3.11 มก./ล., 8.93 NTU, 52 มก./ล. และ 101.33 มก./ล.ตามลำดับ ระยะห่างจากท่าแพ 50 เมตร คือ 27.87 °C, 12.24, 8.15 มก./ล., 1.73 มก./ล., 1.8 NTU, 5.33 มก./ล.และ 98 มก./ล. ตามลำดับ ระยะห่างจากท่าแพ 100 เมตร คือ 27.2 °C, 11.94, 8.41 มก./ล., 1.32 มก./ล., 1.97 NTU, 4 มก./ล. และ 94 มก./ล. ตามลำดับ ค่าพารามิเตอร์ส่วนใหญ่มีค่าเกินเกณฑ์มาตรฐานคุณภาพน้ำผิวดินประเภทที่2 ยกเว้นค่าออกซิเจนละลายมีค่าอยู่ในเกณฑ์มาตรฐาน ช่วงเทศกาลสงกรานต์มีนักท่องเที่ยวเดินทางมาเที่ยวประมาณ 16,716 คนต่อวัน มีนักท่องเที่ยวมานั่งรับประทานอาหารและลงเล่นน้ำเป็นจำนวนมาก ห่างท่าแพออกไป 50 เมตร มีการเล่นห่วงยางและจักรยานน้ำ และห่างท่าแพ 100 เมตร มีการเล่นบานาน่าโบ๊ต ค่าพารามิเตอร์ที่ทำการตรวจวัดหลังเทศกาลสงกรานต์บริเวณท่าแพ คือ 29.5 °C, 10.08, 7.61 มก./ล., 3.48 มก./ล., 26.17 NTU, 92.67 มก./ล. และ 115.33 มก./ล. ตามลำดับ ระยะห่างจากท่าแพ 50 เมตร คือ 29.7 °C, 10.23, 7.77 มก./ล., 3.47 มก./ล., 15.93 NTU, 6 มก./ล. และ 110.67 มก./ล. ตามลำดับ ระยะห่างจากท่าแพ 100 เมตร คือ 29.53°C, 9.98, 8.09 มก./ล., 2.87 มก./ล., 1.93 NTU, 6 มก./ล. และ 103.33 มก./ล. ตามลำดับ ค่าพารามิเตอร์ส่วนใหญ่มีค่าเกินเกณฑ์มาตรฐานคุณภาพน้ำผิวดินประเภทที่ 2 ยกเว้น ออกซิเจนละลายมีค่าอยู่ในเกณฑ์มาตรฐาน จากผลการศึกษาพบว่า คุณภาพน้ำหลังเทศกาลสงกรานต์มีความสกปรกมากกว่าคุณภาพน้ำก่อนเทศกาลสงกรานต์ นั้นแสดงให้เห็นว่ากิจกรรมการท่องเที่ยวที่เกิดขึ้นส่งผลให้คุณภาพน้ำเปลี่ยนแปลงไป

Possibility of Used Algae (*Spirulina*sp.) as to Indicator of Surface Water Quality.

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The objective of this study were investigated the possibility of used *Spirulina*sp. as to indicators of surface water quality. in two natural water sources (KaenNakhon lake and Plastic pond) and two waste water contaminated sources(Sri Than lake and Thung Sang lake). The physical and chemical factor of four water sources was surveyed during June to August, 2010 by sampling in 3 different sampling sites of each source for four times. The result found that the average temperature of KaenNakhon lake, Plastic pond, Sri Than lake and Thung Sang lake was 32.4, 34.0, 33.0 and 31.9 degree Celsius, respectively. The average electrical conductivity of above-mentioned water sources was 374, 224, 1755 and 734 us/cm, respectively. The potential of Hydrogen ion (pH) was 10.44, 10.04, 9.93 and 10.26, respectively. The value of dissolved oxygen (DO) was 10.9, 7.7, 8.3 and 9.2 mg/L, respectively. The BOD of each source was 2.1, 2.4, 14.7 and 13.1 mg/L, respectively. The quantity of *Spirulina*sp. was 28, 1, 5 and 43 body per milliliter. The quantity of *Spirulina*sp. in Thung Sang lake had hightest of 43 body per milliliter. This lake was represented contamination of water. At KaenNakhonlake found *Spirulina*sp. of 28 body per milliliter, it could be representative of natural water sources. The results showed that the quantity of *Spirulina*sp. was correlation with pH and DO at the potential of Hydrogen ion (pH) was 10-11 and the value of dissolved oxygen (DO) was 9-11 mg/L. Thus,*Spirulina*sp. could be used as indicator of surface water quality.

Key word : *Spirulina*sp.

Quality of Groundwater for Consumption in the Area surrounding Community at KhonKaen Landfill Site.

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Water quality of groundwater for consumption in the Area surrounding Community at KhonKaen Landfill Site. this studies were conducted between July to August in 2010. The objective of this study was to determine physical, chemical and biological qualities of four artesian well namely Ban Noikhambon (Noikava), Ban Khambon, Ban Non and temple of Ban Buenggae with various distance from landfill sites of 0.3, 1.3 and 4 km respectively. The results of four artesian well showed that physical quality namely turbidity with values of 0.6, 0.5, 1.6 and 9.5 NTU respectively, pH at values of 6.25, 5.73, 6.24 and 6.50 respectively and conductivity at values of 881.2, 772.5, 1558.3 and 284.0 $\mu\text{g}/\text{cm}$ respectively. Chemical quality namely total dissolved solid with values of 615.5, 726.0, 319.5 and 196.5 mg/L respectively, total hardness at values of 270.1, 225.8, 469.0 and 278.2 mg/L respectively, chloride with values of 226.2, 1553.277.5 and 12.7 mg/L respectively, and nitrate concentrations were found only in Ban Noikaya and temple of Ban Buenggae artesian well with values of 0.7199 and 0.7309 mg/L respectively. Biological quality namely total coliform bacteria showed to have values of 5, 3.7, <3 and 6.3 MPN/100 ml respectively. Results compared to quality of groundwater for consumption show that physical and chemical quality of groundwater were within the acceptable standard. However the chemical values found at temple of Ban Buenggae artesian well were lower than acceptable standard for pH values and higher than acceptable standard for total dissolved values. Biological quality of groundwater with reference to coliform bacteria were mostly higher values than acceptable standard. These findings could be concluded that quality of groundwater showed to have a closed relationship with distances from landfill site. Groundwater from Ban Noikaya, Ban Khambon and Ban Non found to have similar qualities. Temple of Ban Buenggae artesian well had physical chemical values within the standard, except for

biological values showing higher coliform bacteria number over the acceptable standard value.

Key word : Quality of Groundwater

Quantity of Cadmium and Lead in agricultural areas near sanitary landfill of KhonKaen municipality.

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This analysis was aimed to study and measure Cadmium (Cd) and Lead (Pb) quantity around agricultural areas: the rice field, sugar cane field and mango plantation near sanitary landfill of KhonKaen municipality at Ban Kum Bon, Non Thon Sub-district, KhonKaen Province where are away from the sanitary landfill 200 meter, 20 meter and 20 meter respectively (3 cases for each place) with Atomic Absorption Spectrophotometer Technique.

The study showed that an average Cadmium quantity found in rice field, sugar cane field and mango plantation was 0.5778 ± 0.1271 , 0.68707 ± 0.0958 and 0.35 ± 0.0370 ppm respectively while an average of Lead quantity found in those three areas was 16.4167 ± 4.8608 , 18.9426 ± 4.6637 and 13.6593 ± 2.0224 ppm respectively. The quantity of Cadmium found in the rice field and sugar cane field was really close to Lead quantity found in those two areas but higher in mango plantation near the sanitary landfill. That meant contamination of these two heavy metals was higher in the farer area from the sanitary landfill than the nearer area because the farer area might be contaminated by blown air from trash burning at the sanitary landfill and by over flown rain. However, the number of these metals found in those three areas was less than the critical level that was 0.1-2 ppm and 1-3 ppm respectively for Cadmium and 0.1-30 ppm and 70-300 ppm respectively for Lead plant-endangering level that was 3-5 ppm for Cadmium and 100-400 ppm for Lead and soil quality standards utilization for reside and agriculture in Thailand that was no more than 37 ppm for Cadmium and 400 ppm for Lead

Nevertheless, in the long term, the number of these heavy metals might be accumulated and passed on human's food chain through plants and animals . Thus, environmental samples in these agricultural areas should be checked up for further monitoring.

Key word : Cadmium and Lead, Sanitary landfill

Satisfaction of villagers on tap water from the Phoenix Pulp and Paper factory at Khonkaen province.

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The purposes of this study were to study satisfaction of villagers on tap water from the Phoenix Pulp and Paper factory at Khonkaen province. The questionnaires were used 444 copies in 5 villages (Kambongpattana, Nhongbuanoi, Nonudom, Huawjodeand Nonkhampae), the most score of satisfaction is 5. The results showed that the satisfaction level on tap water utilization of villagers 5 village average level was 2.71 ± 0.30 . The satisfaction was medium level. However, found that the satisfaction level on tap water utilization of Nhongbuanoi's villagers, Nonudom's villagers and Huawjode's villagers average level were 2.47 ± 0.11 , 2.48 ± 0.11 and 2.53 ± 0.24 , respectively. The satisfaction was low level. The satisfaction level of cleanness and quality assurance on tap water in the low level. And the satisfaction level of regularity, water pressure, clarity, smell (unless the smell of chlorine) and volume on tap water in the medium level. Present, the number of water users in 593 families indicated the Phoenix Pulp and Paper factory generate tap water 2,000-3,000 m³/day. The suggestion of villagers were quality improvement and clean up of tap water. However, water pressure increase of tap water.

Key word : Satisfaction of villagers

Study of glutinous rice quality used in the community distilled alcohol.

Student :Miss NutjiraThongpak

Project advisor : Dr. LamyaiNeeratanaphan

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The small industrailenterprise such as One Tambon One Product (OTOP) seemed to over spend unnecessarily high budget of production . As the result of using wrong choice of raw material and high cost of processing method. By suggesting the use of Cleaner Technology (CT) could improve more processing method and also reducing the waste product that may be harmful to the environment, have reducing the cost of production .

The study will focus on the choice and quality of glutinous rice use in the fermentation of distilled alcohol in the Donhun's Community Cooperative, AmphurBanphang, KhonKaen province . This community is well recognized in the production of "Inseethong" distilled alcohol by using KorKho's .6 glutinous rice . Analysis of alcohol contented from usingKorKho's. 6 glutinous rice, mixed glutinous rice, Mix of Kor Kho's.6 and mixed glutinous rice and PlaeyKhao (broken rice) as raw material revealed 52.8%, 50%, 47.2% and 40% respectively . Aroma and degree of alcohol on distilled alcohol produced from four recipies of mixed glutinous rice revealed no statistic significant efficient ($P>0.05$) . Taste and Tasters's appreciation showed to have statistic significant ($P<0.05$) on the products . Therefore , by suggesting the alternative raw material to be used in the fermentation process by replacing glutinous rice KorKho's .6 with mixed glutinous rice for better Cleaner Technology showed lower cost of production with equally good quality distilled alcohol.

Key word : glutinous rice

Tap Water Quality in Female Dormitory at KhonKaen University.

Student : Miss Chutima Papeerpong

Project advisor : Dr. Lamyai Neeratanaphan

Department of Environmental Science, Faculty of Science , KhonKaen University. Thailand.

The objective of this study was to determine the physical, chemical and biological of Tap water quality in Female dormitory at KhonKaen University and compared this parameters with standard of Provincial Waterworks Authority. Sampling of Tap water from 4 dormitories during June - July 2011. The result of physical quality, average value of turbidity and pH was 1.25 NTU and 6.65, respectively ; chemical quality, average value of total dissolved solid and chloride was 132.37 mg/L and 12.87 mg/l, respectively; biological quality, average value of coliform bacteria was 1.13 MPN/100 ml. The results in this study can be concluded that parameter such as turbidity, pH, total dissolved solid and chloride were within the standards. However the results for biological parameters were not within the standards because of the pipe water systems or faucet was contaminated. Thus, the manager systems should be check water quality continuously for be safe to users.

Key word : Tap Water Quality

Termites at Khonkaen University.

Student :Miss YaowapaPinkaw

Project advisor :Dr. LamyaiNeeratanaphan

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The study of Termites at Khonkaen University. Two nature forest were Plastic pond and Twenty-five years old building between July to August 2003. Study on taxonomy and some ecological factors; soil textures soil moisture soil temperature and soil pH., tree plant shrubs and herbs. The following was found 4 genus of 2 families were found in this study namely *Microtermes*, *Macrotermes*, *Odontotermes* of Family Termitidae and *Coptotermes* of Family Rhinotermitidae. Plastic pond was found 4 genus of 2 families namely *Microtermes*, *Macrotermes* and *Odontotermes* of Family Termitidae and *Coptotermes* of Family Rhinotermitidae. Twenty-five years old building was found 3 genus of 2 families namely *Microtermes* and *Odontotermes* of Family Termitidae and *Coptotermes* of family Rhinotermitidae. Tree plants 16 species 10 family and Lower plants 14 species 9 family. Physical factor of nature forest at Plastic pond and Twenty-five years old building are soil textures loam, loam sandy ; respectively . soil moistures 5.95, 6.57 ; respectively. Soil temperature 30.78 °C , 25.82 °C; respectively. Soil pH 5.16, 4.24; respectively.

Key word : Termites

The study of environmental and safety on the area of A Foundry Industry in KhonKaen Province : case study factory one.

Student :Miss Thanatsaneesomboon

Project advisor : Dr. LamyaiNeeratanaphan

Department of Environmental Science, Faculty of Science , KhonKaen University. Thailand

The study of the environment and safety in A Foundry Industry in KhonKaenProvince:case study factory one with ten factors,i.e. The illumination,noise exposure, temperature,total dust, waste water management, solid waste management, chemical management, Ventilation and inspection to folk lifts operation.

The result showed that, there are five factors exceed the standard in all sectors, that are temperature (in the range of 22.00 – 31.67 °C), noise exposure (in the range of 64.40 – 88.43 dBA, total dust (not exceed 15 mg/m³). Ventilation is fine, inspection to folk lifts operation is good and ready to be used. The illumination in five sectors did not exceed the standard and the waste water management, solid waste management and chemical management should be improved.

Key word : Environmental and safety

The quality of crushed ice sold in Food and service center of KhonKaen University.

Student : Miss Ketsaraporn Boonchai

Project advisor : Dr. Lamyai Neeratanaphan

Department of Environmental Science, Faculty of Science, KhonKaen University, Thailand.

The determination of crushed ice quality was sold six shops at Food and service center of KhonKaen University. The study was analyzed physical, chemical, biological characteristics of crushed ice. The results show that pH values were above standard criteria (93.75% of total samples), turbidity not above standard criteria, total solid and Lead under standard limits, but Cadmium is not (87.5% of total samples). Coliform bacteria and fecal coliform bacteria were above standard criteria (100% and 50% of total samples, respectively.) However, the coliform bacteria and fecal coliform bacteria values contaminated in crushed ice containers and glasses were not significantly different ($p > 0.05$).

Key word : quality of crushed ice

The Studies Water Quality of Wastewater Treatment System in KhonKaen
University(Domestic Wastewater)

Student :Miss ChanutpornSoontornchai

Project advisor :Dr.LamyaiNeeratanaphan

Department of Environmental Science Faculty of ScienceKhonKaenUniversity

Qualitative study on water qualities in wastewater treatment system within KhonKaen University was conducted on nine parameters. They were pH, temperature, Dissolved Oxygen(DO), Settleable Solids(SS), Total Suspended Solids(TSS), Total Dissolved Solids(TDS), Biochemical Oxygen Demand(BOD), Grease and Oils and Nitrate Nitrogen($\text{NO}_3\text{-N}$). Wastewater samples under study were taken from Common Wastewater Treatment Ponds at the entering point and effluent point. The results were compared with the Standard Quality Control for Wastewater from Building (Type A) to ascertain the quality of wastewater after treatment. The quality of wastewater after full circle of treatment showed to have BOD values reduced from 207.31 mg/L down to 10.65 mg/L which considered to be 95% reduction. TSS values reduced from 73.44 mg/L down to 5.55 mg/L which was 92% reduction. As for SS was completely removed which considered to be 100% reduction. However for pH, DO, TDS, $\text{NO}_3\text{-N}$, grease and oils, this wastewater treatment system were not in accordance with theoreticed hypothesis but the value of pH and TDS were in good agreement with stated standard. Temperatures of wastewater were also fluctuated along with the surrounding temperature duing the time of study. Conclusively, the wastewater treatment system operating within KhonKaenUniversity effectively removed BOD, TSS and SS so as to keep values with in the Standard Quality Control for wastewater from Building (Type A).

การศึกษาคุณภาพน้ำในระบบบำบัดน้ำเสียมหาวิทยาลัยขอนแก่น(น้ำเสียชุมชน)

นักศึกษา : นางสาวชนุตพร สุนทรไชย รหัสประจำตัว 493020724-1

อาจารย์ที่ปรึกษาโครงการวิจัย:ดร.ลำไยณิรัตน์พันธ์

ภาควิชาวิทยาศาสตร์สิ่งแวดล้อม คณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น

การศึกษาคุณภาพน้ำในระบบบำบัดน้ำเสียมหาวิทยาลัยขอนแก่น ทำการศึกษา 9 พารามิเตอร์ คือ ความเป็นกรด-ด่าง(pH) อุณหภูมิ ออกซิเจนที่ละลายน้ำ(DO) ตะกอนหนัก(SS) ของแข็งแขวนลอยทั้งหมด (TSS) ของแข็งละลายทั้งหมด(TDS) ความต้องการออกซิเจนทางชีวเคมี(BOD) น้ำมันและไขมัน(Grease and Oil) และไนเตรท-ไนโตรเจน($\text{NO}_3\text{-N}$) แล้วนำผลมาเปรียบเทียบกับค่ามาตรฐานควบคุมการระบายน้ำทิ้งจากอาคารประเภท ก. ซึ่งทำการศึกษาในส่วนของน้ำเสียที่เก็บมาจากบ่อบำบัดน้ำเสียที่รองรับจากอาคารทั่วไป ภายในมหาวิทยาลัยขอนแก่น โดยทำการเก็บตัวอย่างทั้งหมด 3 จุด ได้แก่ จุดน้ำเข้าระบบบำบัด บ่อกลาง และจุดปล่อยน้ำออกจากระบบบำบัด ระหว่างเดือนสิงหาคม-กันยายน 2552 ผลการศึกษาพบว่า เมื่อน้ำเสียผ่านระบบบำบัดครบวงจรค่าของ BOD ลดลงจาก 207.31 มก./ล. คงเหลือ 10.65 มก./ล. คิดเป็นร้อยละ 95 ส่วนค่า TSS ลดลงจาก 73.44 มก./ล. คงเหลือ 5.55 มก./ล. คิดเป็นร้อยละ 92 สำหรับค่า SS สามารถบำบัดได้ร้อยละ 100 ค่า pH, DO, TDS, $\text{NO}_3\text{-N}$, น้ำมันและไขมัน ระบบบำบัดไม่สามารถลดค่าเหล่านี้ได้ตามทฤษฎีที่คาดไว้ โดยค่า pH และ TDS มีค่าเกินเกินมาตรฐาน ส่วนอุณหภูมิของน้ำเสียที่ผ่านการบำบัดมีค่าแปรผันตามอุณหภูมิทั่วไปในช่วงวันที่ทำการศึกษา แสดงว่าระบบบำบัดน้ำเสียมีประสิทธิภาพในการใช้บำบัดตะกอนหนักปริมาณความต้องการออกซิเจนและของแข็งละลายทั้งหมดได้ดีตามลำดับ และไม่เกินเกณฑ์มาตรฐานการควบคุมคุณภาพน้ำทิ้งจากอาคารประเภท ก.

The study of environmental and safety on the area of A Foundry Industry in KhonKaen.

Province : case study factory one.

Student :Miss Thanatsaneesomboon

Project advisor :Dr. LamyaiNeeratanaphan

Department of Environmental Science, Faculty of Science , KhonKaen University. Thailand.

The study of the environment and safety in A Foundry Industry in KhonKaenProvince:case study factory one with ten factors , i.e. The illumination, noise exposure, temperature, total dust, waste water management, solid waste management, chemical management, Ventilation and inspection to folklifts operation.

The result showed that, there are five factors exceed the standard in all sectors, that are temperature (in the range of 22.00 - 31.67 °C), noise exposure (in the range of 64.40 - 88.43 dBA , total dust (not exceed 15 mg/m³). Ventilation is fine, inspection to folk lifts operation is good and ready to be used. The illumination in five sectors did not exceed the standard and the waste water management, solid waste management and chemical management should be improved.

Key word : environmental and safety

Using the Macro - Benthic Fauna as an Indicator for Water Quality at Huay – Ang Reservoir in Roiet Province.

Student :Miss SukunyaHachai

Project advisor :Dr. LamyaiNeeratanaphan

Department of Environmental Science, Faculty of Science , KhonKaen University. Thailand.

The study of Macro - Benthic Fauna as an indicator for water quality at Huay - ang Reservoir in Roiet province during the month of July to September 2009. Ten sampling sites were selected under this study. The results showed 2 Phyla of invertebrate were Mollusca and Arthropoda consisting of 9 Orders , of benthic fauna with 15 Families. There were Order Mesogastropoda (F. Bithyniidae), Order Veneroida (F. Corbiculidae), Order Odonata (F. Libellulidae, F. Coenagrionidae), Order Ephemeroptera (F. Caenidae, F. Baetidae), Order Trichoptera (F. Leptoceridae), Order Decapoda (F. Palaemonidae), Order Hemiptera (F. Notonectidae, F.Nepitae, F.Corixidae), Order Coleoptera (F. Noteridae, F. Dytiscidae, F. Dytistidae) and Order Diptera (F. Chironomidae) . After acquiring the Biological Data for BMWP Score in Three consecutive analysis BMWP mean values obtained were 4.665, 5.760 and 5.844 respectively. These mean values indicated that water quality is moderate and were in good agreement with other physical parameter such as pH values in the range of 6.36 – 10.43 , mean water temperature are both three month of 32.83 ± 1.12 °c , mean value of dissolved oxygen are both three month of 7.83 ± 0.99 mg/l. Show that water quality at Huay – ang Reservoir suitable for live those living in the water standard of Freshwater Fisheries Institute of Thailand.

Key word:Macro - Benthic Fauna

Using the Water flea (*Moinamacrocopa*) to improve effluent quality from wastewater treatment at KhonKaen University

Student :Miss GinggamolDoodech. Identification number 513020574-6

Project advisor :Dr. LamyaiNeeratanaphan

Department of Environment Science, Faculty of Science, KhonKaen University

The objective of this study was investigate using Water flea (*Moinamacrocopa*) to improve effluent quality from wastewater treatment at KhonKaen University. The parameters were pH, Temperature (T), Biochemical Oxygen Demand (BOD) and Total Suspended Solid (TSS). The experiment were divided into two units : control and experiment water flea treatment, water flea input 20 g/20 liters and the experiment were tested 3 times in 3 weeks. The result of this study in control showed that pH, Temperature, BOD and TSS values were 10.00, 30.60 °C, 14.60 mg /l and 59.00 mg /l, respectively. The experiment water flea treatment showed that values were 8.90, 28.10 °C, 9.30 mg /l and 37.00 mg /l, respectively. The efficiency of treatment in each parameters were 10.50, 8.16, 36.30 and 36.98%, respectively. The data of this study were analyzed by Independent Samples T-Test the results showed that the reduction of this TSS and BOD between the control and experiment water flea treatment was significantly different ($p < 0.05$) and pH between the control and experiment water flea treatment was not significantly different. The result of this study showed that the water flea has been improved effluent quality from wastewater treatment at KhonKaen University. They were reduced the best of TSS compared with other parameters.

นักศึกษา : นางสาวกิงกมล คุณเดช รหัสประจำตัว 510320574-6

อาจารย์ที่ปรึกษาโครงการวิจัย:อ.ดร.ลำไย ณีรัตนพันธุ์

ภาควิชาวิทยาศาสตร์สิ่งแวดล้อม คณะวิทยาศาสตร์ มหาวิทยาลัยขอนแก่น

วัตถุประสงค์ของการศึกษาคือ การใช้ประโยชน์จากไรแดงเพื่อปรับปรุงคุณภาพน้ำจากระบบบำบัดน้ำเสียมหาวิทยาลัยขอนแก่น โดยศึกษาพารามิเตอร์คือ ค่าความเป็นกรด-ด่าง (pH), อุณหภูมิ (Temperature: T), ค่าความต้องการออกซิเจนทางชีวเคมี (Biochemical Oxygen Demand: BOD) และปริมาณของแข็งแขวนลอยทั้งหมด (Total suspended solid: TSS) ซึ่งแบ่งการทดลองออกเป็น 2 หน่วย ได้แก่ ชุดควบคุมไม่ใส่ไรแดง และชุดทดลองใส่ไรแดง โดยใส่ไรแดงปริมาณ 20 กรัม ต่อน้ำตัวอย่าง 20 ลิตร ทำการทดลอง 3 ครั้ง สัปดาห์ละครั้ง ระยะเวลาทั้งหมด 3 สัปดาห์ ผลการศึกษา พบว่า คุณภาพน้ำในชุดควบคุม ค่าความเป็นกรด-ด่าง, อุณหภูมิ, ค่าความต้องการออกซิเจนทางชีวเคมี และปริมาณของแข็งแขวนลอยทั้งหมด มีค่าเฉลี่ยเท่ากับ 10.00, 30.60°C, 14.60mg/l และ 59.00mg/l ตามลำดับ ส่วนคุณภาพน้ำในชุดทดลองใส่ไรแดง มีค่าเฉลี่ยของพารามิเตอร์ เท่ากับ 8.90, 28.10°C, 9.30mg/l และ 37.00 mg/l ตามลำดับ และประสิทธิภาพในการปรับปรุงคุณภาพน้ำแต่ละพารามิเตอร์ มีค่าเฉลี่ยร้อยละ 10.50, 8.16, 36.30 และ 36.98 ตามลำดับ และผลการวิเคราะห์ทางสถิติด้วยสถิติทดสอบแบบ Independent Samples T -Test พบว่าของแข็งแขวนลอยทั้งหมด (TSS) และ ค่าความต้องการออกซิเจนทางชีวเคมี(BOD)ของชุดควบคุมกับชุดทดลองแตกต่างกันอย่างมีนัยสำคัญ ($p < 0.05$) ส่วนความเป็นกรด-ด่าง (pH) ของชุดควบคุมกับชุดทดลองไม่แตกต่างกัน จากผลการศึกษา พบว่า ไรแดงมีประสิทธิภาพในการช่วยลดปริมาณของแข็งแขวนลอยได้ดีที่สุด

Using the Water flea (*Moinamacrocopa*) to improve effluent quality from wastewater treatment at KhonKaen University.

Student : Miss Gingsamol Doodech

Project advisor : Dr. Lamyai Neeratanaphan

Department of Environmental Science, Faculty of Science , KhonKaen University. Thailand.

The objective of this study was investigate using Water flea (*Moinamacrocopa*) to improve effluent quality from wastewater treatment at KhonKaen University. The parameters were pH, Temperature (T), Biochemical Oxygen Demand (BOD) and Total Suspended Solid (TSS). The experiment were divided into two units : control and experiment water flea treatment, water flea input 20 g/20 liters and the experiment were tested 3 times in 3 weeks. The result of this study in control showed that pH, Temperature , BOD and TSS values were 10.00, 30.60 °C, 14.60 mg /l and 59.00 mg /l, respectively. The experiment water flea treatment showed that values were 8.90, 28.10 °C, 9.30 mg /l and 37.00 mg /l, respectively. The efficiency of treatment in each parameters were 10.50, 8.16, 36.30 and 36.98%, respectively. The data of this study were analyzed by Independent Samples T-Test the results showed that the reduction of this TSS and BOD between the control and experiment water flea treatment was significantly different ($p < 0.05$) and pH between the control and experiment water flea treatment was not significantly different. The result of this study showed that the water flea has been improved effluent quality from wastewater treatment at KhonKaen University. They were reduced the best of TSS compared with other parameters.

Key word : Water Flea, Wastewater Treatment

Using Benefit Area of Botanic Garden in North-eastern Thailand AtKhonkaen Province.

Student :Miss WaridaVongmakheb

Project advisor :Dr.LamyaiNeeratanaphan

Department of Environmental Science, Faculty of Science , KhonKaen University. Thailand.

The objective of this study was to investigate the use of area in the Botanic Garden of the Northeast and its deterioration. Two study groups were given separate questionnaires, the first group is the general public of 19 people and the second is the villagers of 196. The survey was conducted during June to July 2010. The study found that 75 percent of villager utilized the area and 25 percent did not. The most utilization of the area was water (20.77%), relaxation (17.66%),fisheries(15.06%). The most deteriorated area was at the lotus pond (42.8%), Pae Rim Tung restaurant (42.70%), the pond (14.5%). The most deteriorated condition that was visible was the increase of garbage (60%) and the polluted pond(40%). The study found that the community and the general public utilized the area in accordance with the serving objective of the Botanic Garden. Regarding the deteriorating conditions of the area, we propose that every sector, the authorities, officials, villagers and the general public should be more aware of the common benefit of the Botanic Garden and work together to manage the utilization.

Key word : Using Benefit Area,Botanic Garden

Water quality of some parameters in Sam Chan reservoir at the area of Ban Kham Bon landfill site, KhonKaen province .

Student : Miss Thanawan Pinawet

Project advisor : Dr. Lamyai Neeratanaphan

Department of Environmental Science, Faculty of Science , KhonKaen University. Thailand.

The objective of this study was to investigate water quality of some parameters in the surface water of Sam Chan reservoir at the area of Ban Kham Bon landfill site. The parameters were studied in June 2011 during the rainy season, which results in an excessive amount of leachate and potential contamination of surface water in Sam Chan reservoir. Sampling of water was conducted three times on six parameters. They were Temperature, Positive Potential of Hydrogen ion (pH), Dissolved oxygen (DO), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS) and Coliform bacteria. The average results of this study showed values were 31.0°C, 6.94, 5.27 mg/l, 15.82 mg/l, 21.92 mg/l and 193.33 MPN/100 ml, respectively. Comparison of this data with surface water quality standard found that the parameters were kept within the type 3 of the surface water quality standard for consumption and agriculture.

Key word : Water quality