ESTABLISHMENT OF WASTEWATER ANALYTICAL PROCEDURE FOR NUCLEAR MEDICINE CENTERS

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Abstract

The analysis of medical wastewater for aim of controlling wastewater quality before discharging into environment has been a very important work in the nuclear medicine faculties. Center for Nuclear Techniques (CNT) planed to build laboratories national standards for analyzing wastewater samples which could contain radioactive isotops. By support of the Vietnam Atomic Energy Institute (VINATOM), CNT have carried out the project (CS/15/02- In this study, we have built laboratory processes for analyzing the medical wastewater samples based on the Standard of QCVN 28: 2010/BTNMT at CNT. To verify the processes, 21 wastewater samples were collected from 3 hospitals for investigating. Results show that the processes meet annalytial quality, conditions and equipments of CNT. 01): "Building wastewater analytical process for nuclear medicine faculties".

Key words: Analysis, medical wastewater, nuclear medicine

1. Introduction

Medical wastewater is a source of environmental polution. In aim of contralling wastewater quality before discharging into environment, medical facilities must have systems for collecting, treating wastewater which requires in accceptably level of the special standards depending on each country [1].

Annually, the Ministry of Health, Ministry of Natural Resources and Environment guide and evalue wastewater quality at the medical facilities. The methods and the requirements of wastewater analysis are guided by the national standard QCVN 28: 2010/BTNMT. The targets of interest include as: pH, BOD, COD, TSS, sulfur, ammonium, nitrate, total activity of alpha, total activity of beta ...[2]

Center for Nuclear Techniques is a scientific and technological organization where can perform professional duties of environment. Establishment and development of laboratory processes for collecting and analyzing of medical wastewater according to the QCVN 28: 2010/BTNMT is a necessary requirement which can meet social needs and increase capacity of analysis services [2]

FIG .1. pH/Dissolved Oxygen/Conductivity Measuring Instrument

FIG .2. BOD meter

FIG .3. Total activity of alpha, beta

2. Experimental

In this work, the QCVN 28: 2010/BTNMT is used as an analtical process [2]. By this way, 21 samples of wastewater were collected for the analysis according to the process to check accuracy. All water samples were collect at Cho Ray Hospital (04 samples), Ho Chi Minh city oncology hospital (13 samples) and FV hospital (04 samples).

The samples of wastewater were collected at 02 sources of waste water. The first sources are at a new wastewater storage into the tank and the second ones are at the areas where contains the treated wastewater and the wastewater for discharging into environment. For each sample, 5 liters of wastewater colleted by pump in waste tank and bucket at position of sewage pipes [3].

Table 1. The samples were colleted and analyzed.

Sample name	Laboratory	Note
WQS001	Institute of Public Health	Control sample
WQS002	Institute of Public Health	Control sample
WQS003	Center for Nuclear Techniques	Self-analysis
WQS004	Center for Nuclear Techniques	Self-analysis
WQN001	Institute of Public Health	Control sample
WQN002	Institute of Public Health	Control sample
WQN003	Center for Nuclear Techniques	Self-analysis
WQN004	Center for Nuclear Techniques	Self-analysis
WQB001	Institute of Public Health	Control sample
WQB002	Institute of Public Health	Control sample
WQB003	Center for Nuclear Techniques	Self-analysis
WQB004	Center for Nuclear Techniques	Self-analysis
WQB005	Center for Nuclear Techniques	Self-analysis
WQB006	Center for Nuclear Techniques	Self-analysis
WQB007	Center for Nuclear Techniques	Self-analysis
WQB008	Center for Nuclear Techniques	Self-analysis

WQB009	Center for Nuclear Techniques	Self-analysis
WQB010	Center for Nuclear Techniques	Self-analysis
WQB011	Center for Nuclear Techniques	Self-analysis
WQB012	Center for Nuclear Techniques	Self-analysis
WQB013	Center for Nuclear Techniques	Self-analysis

3. Results and discussion

Table 2: Analysed results for the first samples

Analytical indicators	Unit	Sample name							
		WQS001	WQS002	WQS003	WQS004	WQN001	WQN002	WQN003	WQN004
pH	-	6.76	7.15	6.85	7.22	6.70	7.34	6.86	7.45
BOD	mg/l	10.11	13.67	9.78	13.46	11.33	21.24	12.12	21.36
COD	mg/l	26.00	21.75	25.87	27.12	35.00	26.00	32.34	26.11
TSS	mg/l	2.50	41.23	2.89	40.54	17.84	2.50	18.08	2.58
Sulfate	mg/l	0.02	1.24	0.02	1.32	0.02	0.02	0.02	0.02
Ammonium	mg/l	12.44	6.27	12.35	5.97	13.07	4.66	13.26	4.81
Nitrate	mg/l	14.00	23.17	13.97	23.58	13.12	14.00	13.19	14.17
Phosphate	mg/l	1.50	1.32	1.62	1.38	1.40	1.50	1.46	1.55
Total activity of alpha	Bq/l	0.446	0.093	0.436	0.094	0.394	0.061	0.387	0.057
Total activity of beta	Bq/l	304.668	0.877	298.237	0.891	341.072	0.654	338.658	0.632

Table 3: Analysed results for the second samples

Analytical indicators	Unit	Sample name							
		WQB001	WQB002	WQB003	WQB004	WQB005	WQB006	WQB007	WQB008
pH	-	6.73	7.32	6.76	7.35	6.81	7.14	7.08	6.98
BOD	mg/l	9.89	11.21	9.92	11.36	9.96	12.41	12.45	12.38
COD	mg/l	33.00	16.45	33.13	16.38	33.32	17.86	17.61	17.38
TSS	mg/l	7.88	3.56	7.96	3.60	7.93	3.84	3.79	3.84
Sulfate	mg/l	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Ammonium	mg/l	12.68	3.25	12.81	3.31	12.76	3.38	3.37	3.40

Nitrate	mg/l	9.33	12.34	9.41	12.40	9.39	12.42	12.41	12.43
Phosphate	mg/l	2.10	1.34	2.16	1.38	2.17	1.38	1.39	1.40
Total activity of alpha	Bq/l	0.463	0.087	0.445	0.081	0.447	0.063	0.064	0.063
Total activity of beta	Bq/l	396.647	0.921	384.657	0.909	388.552	0.725	0.718	0.734

Table 4: Analysed results for the final samples

Analytical indicators	Unit	Sample name				
		WQB009	WQB010	WQB011	WQB012	WQB013
pH	-	7.07	7.05	7.24	6.99	7.14
BOD	mg/l	12.12	12.16	12.35	12.40	12.37
COD	mg/l	33.42	33.47	17.34	17.48	17.43
TSS	mg/l	7.98	7.95	3.90	3.84	3.86
Sulfate	mg/l	0.02	0.02	0.02	0.02	0.02
Ammonium	mg/l	12.74	12.71	3.38	3.36	3.37
Nitrate	mg/l	9.37	9.34	12.44	12.39	12.38
Phosphate	mg/l	2.15	2.13	1.41	1.39	1.39
Total activity of alpha	Bq/l	0.444	0.446	0.062	0.063	0.061
Total activity of beta	Bq/l	389.345	389.013	0.727	0.724	0.731

Analysed results of 21 samples of wastewater collected at Cho Ray Hospital, Ho Chi Minh city Oncology Hospital and FV hospital show values which are relatively similar.

Samples of WQS001, WQS002, WQS003 and WQS004 were taken at the same times. WQS001 and WQS003 were taken at the same position. WQS002 and WQS004 were taken at the same position. In comparison of the value of targets of such sample pair, we found that the parameters are relatively the same, the indicator analysis has had similar results as in the group of authors and the control samples.

Samples of WQN001, WQN002, WQN003 and WQN004 were taken at the same times. WQN001 and WQN003 were taken at the same position. WQN002 and WQN004 were taken at the same position. In comparison of the value of targets of such sample pair, we found that the parameters are relatively the same, the indicator analysis have had similar results as in the group of authors and the control samples.

Samples of WQB001, WQB002, WQB003 and WQB004 were taken at the same times. WQB001 and WQB003 were taken at the same position. WQB002 and WQB004 were taken at the same position. In comparison of the value of targets of such sample pair, we found that the parameters are relatively the same, the indicator analysis have had similar results as in the group of authors and the control samples

Samples of WQB006, WQB007 and WQB008 were taken at the same time and position. When we compare the value of targets of these samples, we found that the parameters are relatively similar.

Samples of WQB009 WQB010, WQB011, WQB012 and WQB013 were taken at the same time and position. WQB009 and WQB010 were taken at the same position. WQB011, WQB012 and WQB013 were taken at the same position. In comparison of the value of targets of such sample pair, we found that the parameters are relatively the same.

The results of our analysis showed that wastewater samples at the first waste tank is higher than the wastewater sample of public sewage, especially for total alpha activity and total activity of beta [3].

4. Conclusions

In this study, we have built laboratory processes for analyzing the medical wastewater samples based on the Standard of QCVN 28: 2010/BTNMT at CNT. To verify the processes, 21 wastewater samples were collected from 3 hospitals for investigating. The Results show that the processes meet analytial quality, conditions and equipments of CNT. Our results have demonstrated that the wastewater analysis process and analytical methods of the authors are satisfactory, suitable to the existing conditions and equipments of the CNT.

Reference

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XÂY DỰNG QUY TRÌNH PHÂN TÍCH NƯỚC THẢI CHO CÁC CƠ SỞ Y HỌC HẠT NHÂN

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Tóm tắt:

Việc phân tích nước thải y tế nhằm mục đích kiểm soát chất lượng nước thải trước khi thải ra môi trường là một công việc rất quan trọng trong các khoa y học hạt nhân. Trung tâm Hạt nhân Tp. Hồ Chí Minh (CNT) đã lên kế hoạch xây dựng các phòng thí nghiệm theo tiêu chuẩn quốc gia để phân tích các mẫu nước thải có thể chứa các đồng vị phóng xạ. Nhờ sự hỗ trợ của Viện Năng lượng nguyên tử Việt Nam (VINATOM), CNT đã thực hiện dự án (CS/15/02 - Trong nghiên cứu này, chúng tôi đã xây dựng các quy trình thí nghiệm để phân tích các mẫu nước thải y tế dựa trên quy chuẩn QCVN 28: 2010/BTNMT tại CNT. Để xác minh các quy trình, 21 mẫu nước thải đã được thu thập từ 3 bệnh viện để điều tra. Kết quả cho thấy các quy trình đáp ứng chất lượng, điều kiện và thiết bị của CNT. 01): "Xây dựng quy trình phân tích nước thải cho các cơ sở y học hạt nhân".

Từ khóa: Phân tích, nước thải y tế, y học hạt nhân