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Titre: Crossflow microsand filtration in cooling tower systems to control fouling in heat exchanger devices. Supplément
Title:

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Authors:

Date: 2024

Type: Article de revue / Article

Référence: Ashok, V., Absalan, F., Silverwood, A., Robert, É., Claveau-Mallet, D., & Bédard, É. (2024). Crossflow microsand filtration in cooling tower systems to control fouling in heat exchanger devices. Journal of Building Engineering, 95, 110167 (11 pages). https://doi.org/10.1016/j.jobe.2024.110167
Citation:

Document en libre accès dans PolyPublie
Open Access document in PolyPublie

URL de PolyPublie: https://publications.polymtl.ca/58888/
PolyPublie URL:

Version: Matériel supplémentaire / Supplementary material
Révisé par les pairs / Refereed

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Document publié chez l'éditeur officiel
Document issued by the official publisher

Titre de la revue: Journal of Building Engineering (vol. 95)
Journal Title:

Maison d'édition: Elsevier
Publisher:

URL officiel: https://doi.org/10.1016/j.jobe.2024.110167
Official URL:

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Crossflow microsand filtration in cooling tower systems: A sustainable approach to control fouling in heat exchanger devices

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Figure 1.S Pilot study circuit

Table 1.S Specifications of the hospital building plate heat exchanger sampled for this study

Table 2.S Physicochemical characteristics of the recirculating water inside the circuit measured through bi-weekly sampling at the purge (Figure 1) from April 2022 to May 2023, prior to HX cleaning.

Figure 1.S Pilot study circuit

Table 1.S Specifications of the hospital building plate heat exchanger sampled for this study

Brand	Armstrong (Model: S-48-1250-81)
Material	Zinc plated stainless steel 304
Size	29.5” x 62.8”
Gasket material	NBR-glued
Surface per unit (ft^2)	503.62
No. of plates	81
Heat exchanged (Btu/h)	4931697
Fluid circulated (gpm)	1300 gpm, 1100 gpm
LMTD (^oF)	7.68
Design pressure (PSI)	150
Plate thickness (mm)	0.6
Design temperature (^oF)	210

Table 2.S Physicochemical characteristics of the recirculating water inside the circuit measured through bi-weekly sampling at the purge (Figure 1) from April 2022 to May 2023, prior to HX cleaning. Values given in the parenthesis are minimum and maximum observed values during this study.

Parameters	**Unit**	**Onsite HX** **Mean values* ± SD (min-max)** **n=20**
Temperature	°C	22.7 ± 2.0 (17.9-27.5)
pH	pH units	8.5 ± 0.2 (7.9-8.9)
Conductivity	µS/cm	694 ± 226 (365-1146)
Free chlorine	mg/L	0.48 ± 0.99 (0 – 4.3)
Total chlorine	mg/L	0.68 ± 1.19 (0 – 4.9)
Total dissolved solids	mg/L	458 ± 149 (241-960)
Total suspended solids	mg/L	1.3 ± 1.5 (0.0-9.2)
Total alkalinity	mg/L as $CaCO_3$	198 ± 7.1 (98-345)
Dissolved oxygen	mg/L	9.0 ± 0.6 (8.3-11.2)
Chloride	mg Cl^-/L	69 ± 31 (27-119)
Sulphate	mg SO_4^{2-} /L	44 ± 20 (19-89)
Phosphate	mg PO_4^{3-} /L	1.9 ± 3.1 (0.2-19)
Calcium	mg Ca^{2+} /L	66 ± 24 (25-133)
Magnesium	mg Mg^{2+} /L	24 ± 13 (6-49)

*SD: standard deviation;
n = number of measurements;