



**{In Archive} Fw: Equation 7-1**

**palmeag** to: John King

09/23/2010 05:56 PM

From: palmeag@nu.com

To: John King/R1/USEPA/US@EPA

History: This message has been forwarded.

Archive: This message is being viewed in an archive.

As I thought. Good for you?

----- Forwarded by Allan G. Palmer/NUS on 09/23/2010 05:51 PM -----

From: "Richard Clubb" <rclubb@enercon.com>

To: Allan G. Palmer/NUS@NU

Cc: "'Ashlie Brown'" <abrown@enercon.com>, <sbeaver@enercon.com>

Date: 09/22/2010 11:25 AM

Subject: RE: Equation 7-1

Allan,

You are correct, the equation is misleading (although the calculation is correct). For clarity, the equation could be updated as follows:

$$\text{Monthly Thermal Discharge} = 8200 \frac{\text{gal}}{\text{min}} (T_{\text{inlet}} - T_{\text{outlet}}) \left( 8.33 \frac{\text{lb}}{\text{gal}} \right) \left( 1 \frac{\text{BTU}}{\text{F} \times \text{lb}} \right) \left( \frac{30 \text{ days}}{\text{month}} \right)$$

Two considerations went into the original writing of Equation 7-1. First, a 8.33 lb/gal density of water was selected as it was listed in EPA's Information Request and is accurate for pure water at ~70°F (a 8.34 lb/gal density of water was provided by PSNH for use at Schiller, which is marginally higher than Merrimack since salt water and colder water is more dense). Second, since the equation was being used to calculate both monthly and annual heat load values, it was preferable for us to develop an equation that was dimensionless with respect to time. As originally written Equation 7-1 calculates a BTU scalar, which is then multiplied by a defined unit of time (in minutes). Understandably, this equation may cause confusion and could be updated to the equation above; however, the numbers reported in Table 7-2 are correct.

Let me know if it would be beneficial to quickly update the document and send a fresh .pdf report.

Richard Clubb, PE  
Enercon Services, Inc.  
(678) 797-5035

\*\*\*\*\*

This e-mail, including any files or attachments transmitted with it, is confidential and/or

proprietary and is intended for a specific purpose and for use only by the individual or entity to whom it is addressed. Any disclosure, copying or distribution of this e-mail or the taking of any action based on its contents, other than for its intended purpose, is strictly prohibited. If you have received this e-mail in error, please notify the sender immediately and delete it from your system. Any views or opinions expressed in this e-mail are not necessarily those of Northeast Utilities, its subsidiaries and affiliates (NU). E-mail transmission cannot be guaranteed to be error-free or secure or free from viruses, and NU disclaims all liability for any resulting damage, errors, or omissions.

\*\*\*\*\*



**{In Archive} Re: Thermal Question**

**palmeag** to: John King

09/08/2010 03:50 PM

From: palmeag@nu.com  
To: John King/R1/USEPA/US@EPA  
Archive: This message is being viewed in an archive.

John, There are two separate reasons for your question:

1) Why don't the average monthly values add up to the annual value?

Answer: Besides the minor rounding off difference always inherent in these types of calculations, months vary in length, so when adding average monthly values together it is necessary to weight each month by its duration.

2) Why don't the maximum monthly values add up to the annual value?

Answer: We calculated absolute maximum values using the hourly maximum temperature differentials provided in Table 7-1 over the entire month. So for example, the maximum thermal discharge value for January was calculated assuming the maximum hourly temperature differential of 22.2 F occurred continuously throughout the entire month of January. Likewise, the maximum annual thermal discharge value was calculated assuming the maximum hourly temperature differential of 26.1 F occurred continuously throughout the entire year.

From: king.john@epamail.epa.gov  
To: Allan G. Palmer/NUS@NU  
Date: 09/07/2010 01:25 PM  
Subject: Thermal Question

Allan,

Table 7-2, p. 22, of the July 2010 submission list thermal loads discharged from a Merrimack Station closed cycle cooling system. The monthly numbers when added do not equal the annually average and maximum discharges. Is that because the annual thermal discharge was a separate calculation.

Thank you, John

\*\*\*\*\* This e-mail, including any files or attachments transmitted with it, is confidential and/or proprietary and is intended for a specific purpose and for use only by the individual or entity to whom it is addressed. Any disclosure, copying or distribution of this e-mail or the taking of any action based on its contents, other than for its intended purpose, is strictly prohibited. If you have received this e-mail in error, please notify the sender immediately and delete it from your system. Any views or opinions expressed in this e-mail are not necessarily those of Northeast

Utilities, its subsidiaries and affiliates (NU). E-mail transmission cannot be guaranteed to be error-free or secure or free from viruses, and NU disclaims all liability for any resulting damage, errors, or omissions.

\*\*\*\*\*



**{In Archive} Thermal Question**

**John King** to: palmeag

09/07/2010 01:28 PM

From: John King/R1/USEPA/US  
To: palmeag@nu.com  
Archive: This message is being viewed in an archive.

Allan,

Table 7-2, p. 22, of the July 2010 submission list thermal loads discharged from a Merrimack Station closed cycle cooling system. The monthly numbers when added to not equal the annually average and maximum discharges. Is that because the annual thermal discharge was a separate calculation.

Thank you, John