

**Additional Information**  
**on the Proposed Methodology “ Energy Saving by Introducing High Efficiency screw chiller for freezing and refrigeration”**

**1. Identification of reference cooling system**

A research was conducted to identify cooling system that supply cold water for freezing and refrigeration at manufacturing factories in Thailand. In general, ice storage system with reciprocation type compressor (refrigerant: Ammonia) is widely installed at manufacturing factories for freezing and refrigeration purpose to treating wide range of heat load, while some factories newly install water/brine chilling system with screw type compressor instead of installing ice storage system .

According to the interview, it is expected that the installation of energy efficient screw type water chiller as well as brine chiller will be gradually increased in Thailand. In addition, the identified chiller is regarded as non-inverter type because the water/brine chillers marketed in Thailand are not equipped with inverter.

From the above reason, reference chilling system for freezing and refrigeration in this methodology is identified as non-inverter type screw brine chiller.

**2. Research on COP value for available reference screw chiller and identification of reference COP**

Research on COP of reference chiller was conducted through collecting catalogues of screw chiller that correspond to brine chilling<sup>1</sup>. As the result, 2 companies (3 models) were identified and 24 COP values are collected as shown in Figure 1 below within the range that cooling capacity is less than or equals to 1,000 kW.

Although COP values by manufacturer's testing under the temperature condition based on JIS B 8613-1994<sup>2</sup>, they are standardized with the equation as indicated in Criterion 2 on the proposed methodology.

COP value varies according to cooling capacity, it is observed that those COP values (around 4.70) with cooling capacity of less than 520 kW show clearly smaller than those ranging more than 520 kW. On the other hand, the value is lower than 4.72 of the COP value for screw type chiller recommended by Thai government under the standardized condition. So, 4.97, the COP value for cooling capacity of 520kW in

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<sup>1</sup> Premium type chilling units which are applicable to down to lower than -10 °C leaving fluid temperature are not included for available data.

<sup>2</sup> JIS B 8613-1994 Water chilling unit (<http://kikakurui.com/b8/B8613-1994-01.html>)

Company B model 2, is adopted as the reference one for smaller category for cooling capacity in conservative manner.

Therefore, two cooling capacity ranges are set to determine the reference COP values for each range.

The most efficient COP, which has the largest value, in each capacity range is selected as the reference COP and shown in Table 1 below in red circles.

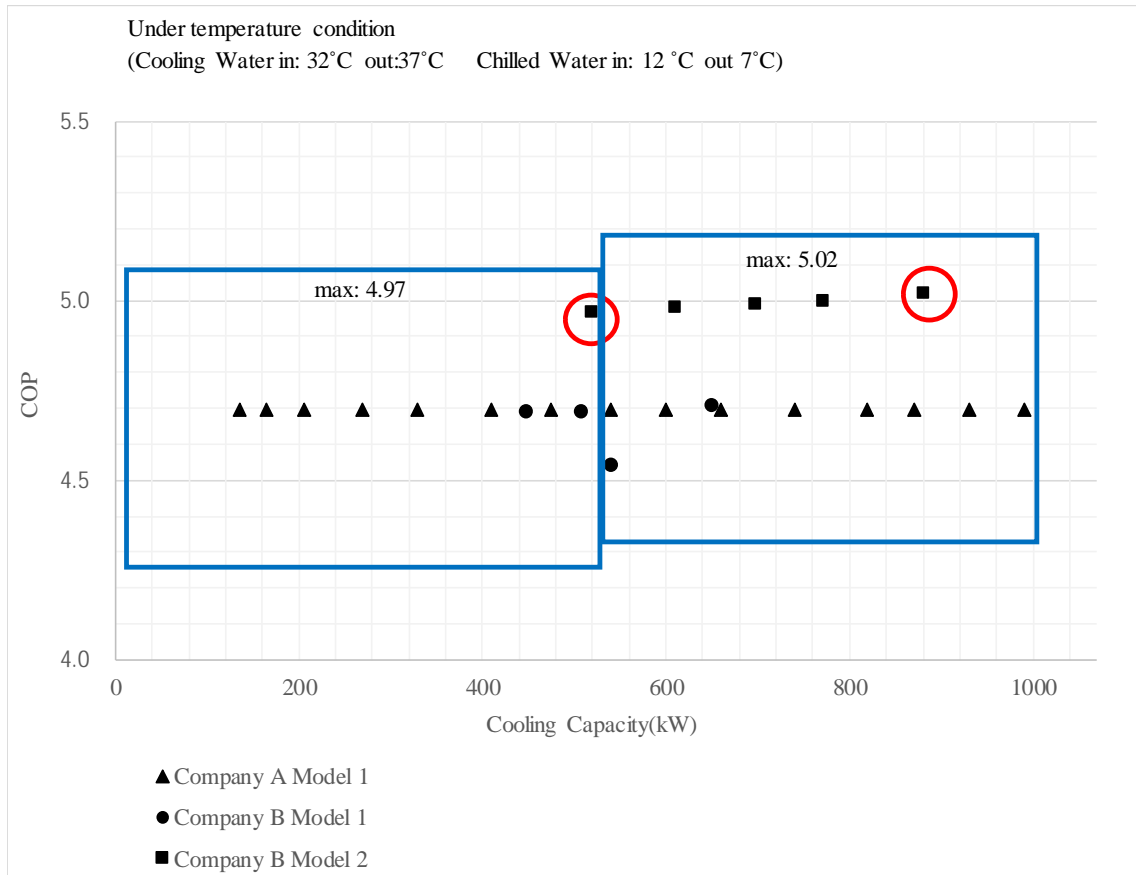


Figure 1: Standardized COP values of screw type water chiller

The reference COP of screw chiller for each cooling capacity range is determined and shown in Table 1 below. (“x” in the table represents cooling capacity per unit.)

Table 1: Established  $COP_{RE,i}$  of screw chiller for the proposed methodology

Cooling capacity per unit (kW)	$x \leq 520$	$520 < x \leq 1,000$
$COP_{RE,i}$	4.97	5.02