Appendix 1

Additional information to the proposed JCM methodology

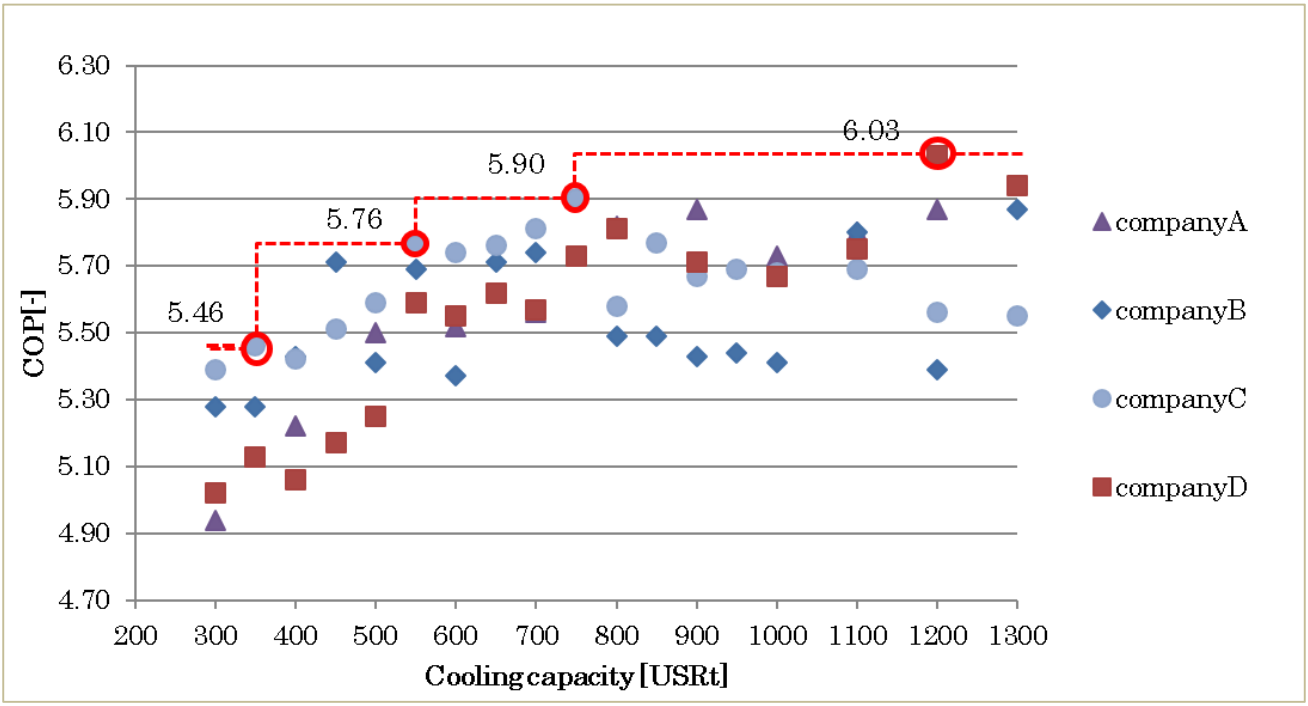
"Introduction of High Efficiency Centrifugal Chiller" on setting default value for reference COP

1. Market of centrifugal chillers in Cambodia

Although the number of centrifugal chillers is increasing little by little, market of centrifugal chillers in Cambodia is still very small so far. From the hearing survey with the local users, it is found that only major companies have possibilities to have sales performance of centrifugal chillers in Cambodia. These are top 4 manufactures who have dominant market share not only in the world but also in the Cambodia. It is also found that there are a few existing chillers already installed in Cambodia. The COP of those chillers are approximately 5.0 and it is assumed that those old type chillers will be used continuously to avoid e new investment.

2. Determination of the default value for reference COP values

The following figure1 shows the COPs of the chillers available in the Cambodian market. In total 56 representative COP values of Cambodian chiller market have been obtained from 4 major Companies. All data were surveyed in the same standard temperature conditions[1].



Source: Based on the manufacturer's information

Note: 1 USRt = 3.52 kW

Figure1: COP Values of Candidate Reference Chillers

It is known that the chillers with larger cooling capacity tend to have better energy efficiency than ones with

[1] Chilled water : output: 7 degrees Celsius, input : 12 degrees Celsius
Cooling water : output : 37 degrees Celsius, input : 32 degrees Celsius

smaller capacity. Accordingly, the COPs are categorized based on the cooling capacity ranges.

The default COP values are set conservatively in the following manner:

1. The COP value tends to increase as the cooling capacity become larger
2. The reference COP, which has a certain cooling capacity, is set at a maximum value in corresponding cooling capacity range
3. The maximum values of COP in each cooling capacity ranges are defined as Default $COP_{RE,i}$ as described in Table1

Table1: Default $COP_{RE,i}$

Cooling capacity per unit (USRt)	$300 \leq x \leq 350$	$350 < x \leq 550$	$550 < x \leq 750$	$750 < x \leq 1,300$
$COP_{RE,i}$	5.46	5.76	5.90	6.03

Note: “x” in the table represents cooling capacity per unit.