


Status of JCM Implementation in Thailand

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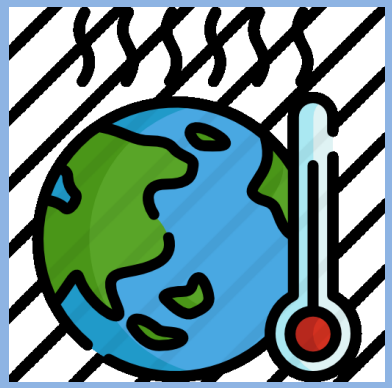
Session 2: Information Sharing on the JCM Project Implementation

Seminar on the Joint Crediting Mechanism (JCM) Implementation in Thailand –

Accelerating Low Carbon Development through JCM Scheme

11th September 2018



JCM Joint Crediting Mechanism

Roles of Thailand Greenhouse Gas Management Organization: TGO

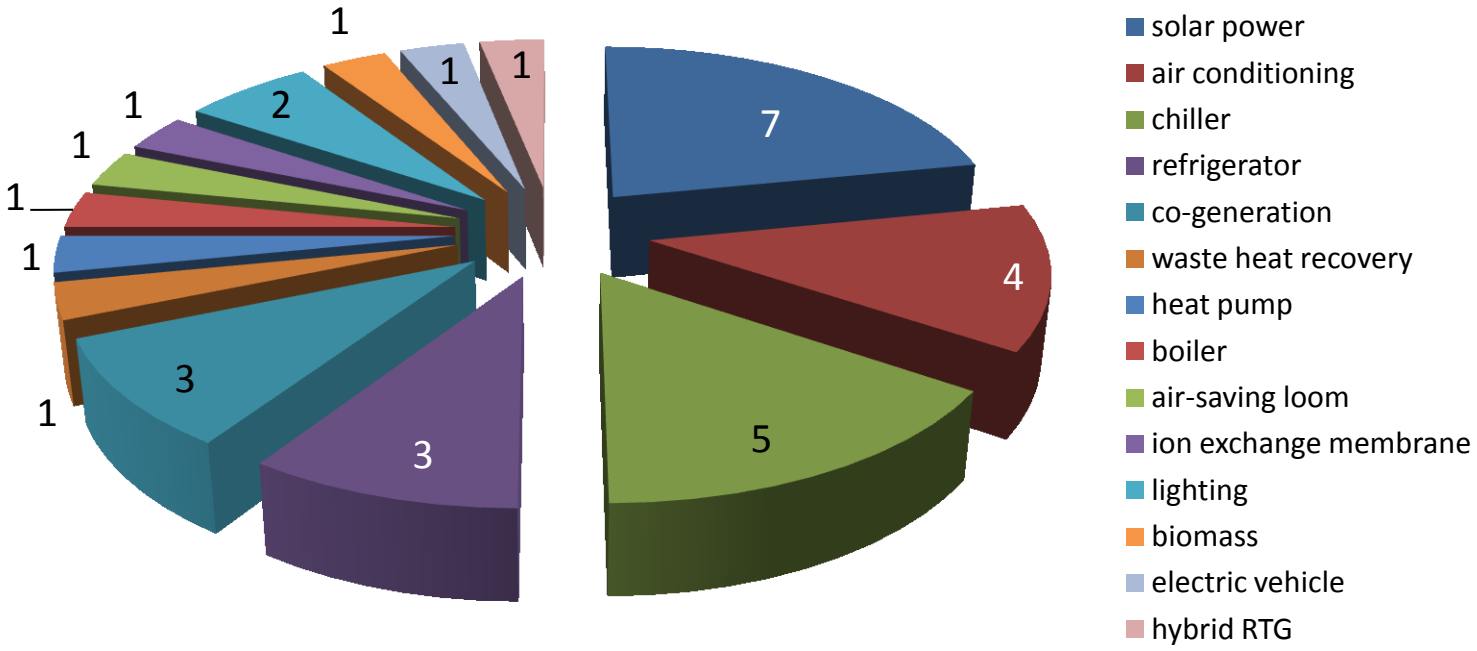
Thailand Greenhouse Gas Management Organization is a public organization under the Ministry of Natural Resources and Environment (MoNRE) and is designated by the cabinet to be a secretariat of the JCM of the Thai side. TGO serves the Joint Committee by performing the work for the implementation of the JCM since November 2015. Besides, TGO also

- check the completeness and correctness of
  - draft methodologies
  - Project Design Documents (PDDs)
  - monitoring reports
- check the qualification of the Third Party Entity (TPE)
- participate the local stakeholder consultation meetings
- on-site visit JCM Model Projects
- promote the development of JCM projects in Thailand
- organize/co-organized seminars/workshops on JCM
- publish data about JCM on website

Type of JCM Model Projects

Project type	Number of projects	GHG reduction (tCO_2/y)
Energy efficiency	18	90,592
Renewable energy	8	39,080
	26	129,672

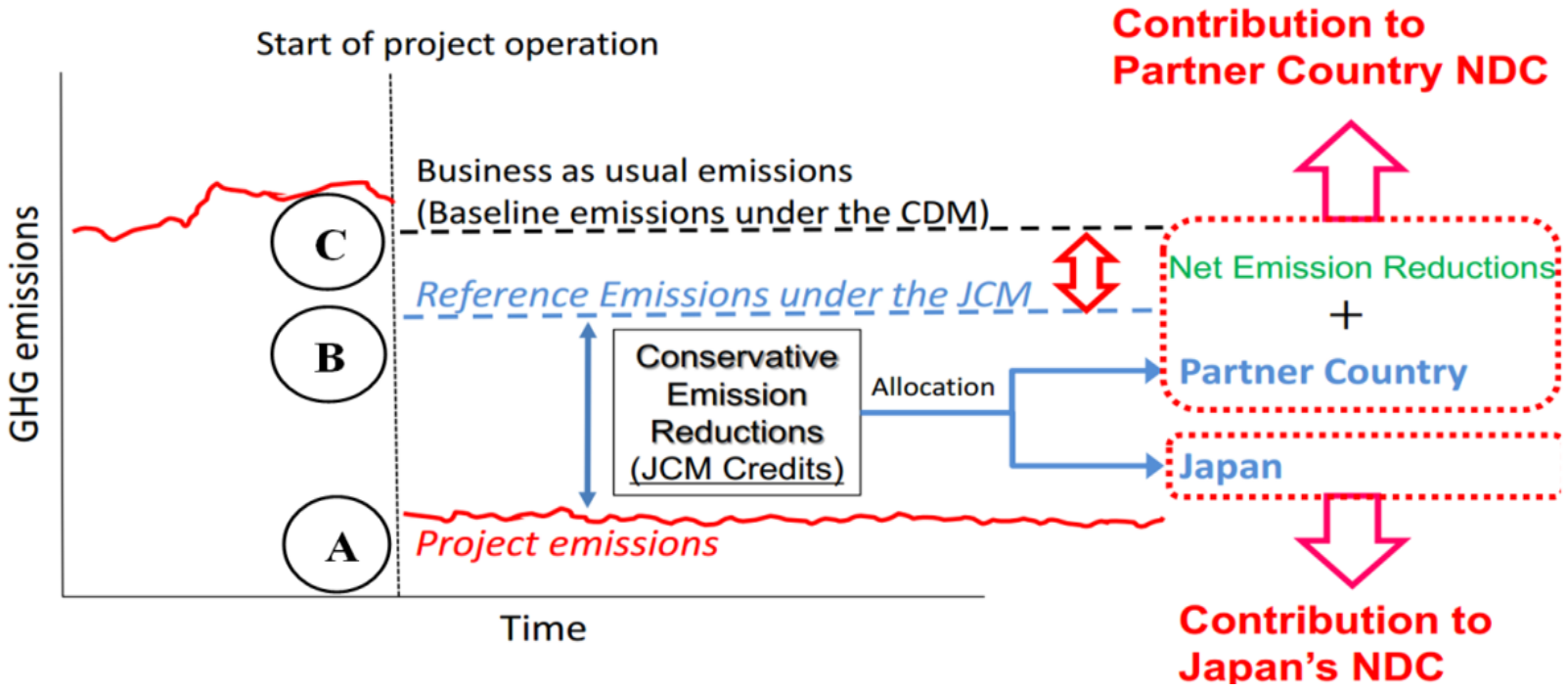
number of project categorized by technology



Approved JCM Methodologies

Methodology code	Title	Approval
TH_AM001	Installation of Solar PV System	23 Aug 2016
TH_AM002	Energy Saving by Introduction of Multi-Stage Oil-Free Air Compressor	Version 1.0 23 Aug 2016
		Version 2.0 21 Aug 2017
TH_AM003	Energy Saving by Introduction of High Efficiency Centrifugal Chiller	21 Aug 2017
TH_AM004	Installation of Energy Saving air Jet Loom at Textile Factory	21 Aug 2017
TH_AM005	Energy Saving by Introduction of Non-Inverter High Efficiency Centrifugal Chiller	21 Aug 2017
TH_AM006	Installation of Displacement Ventilation Air Conditioning Unit in the Cleanroom of Semiconductor Manufacturing Factory	21 Aug 2017
TH_AM007	Power Generation by Waste Heat Recovery in Cement Industry	20 Apr 2018

Calculation of emission reductions



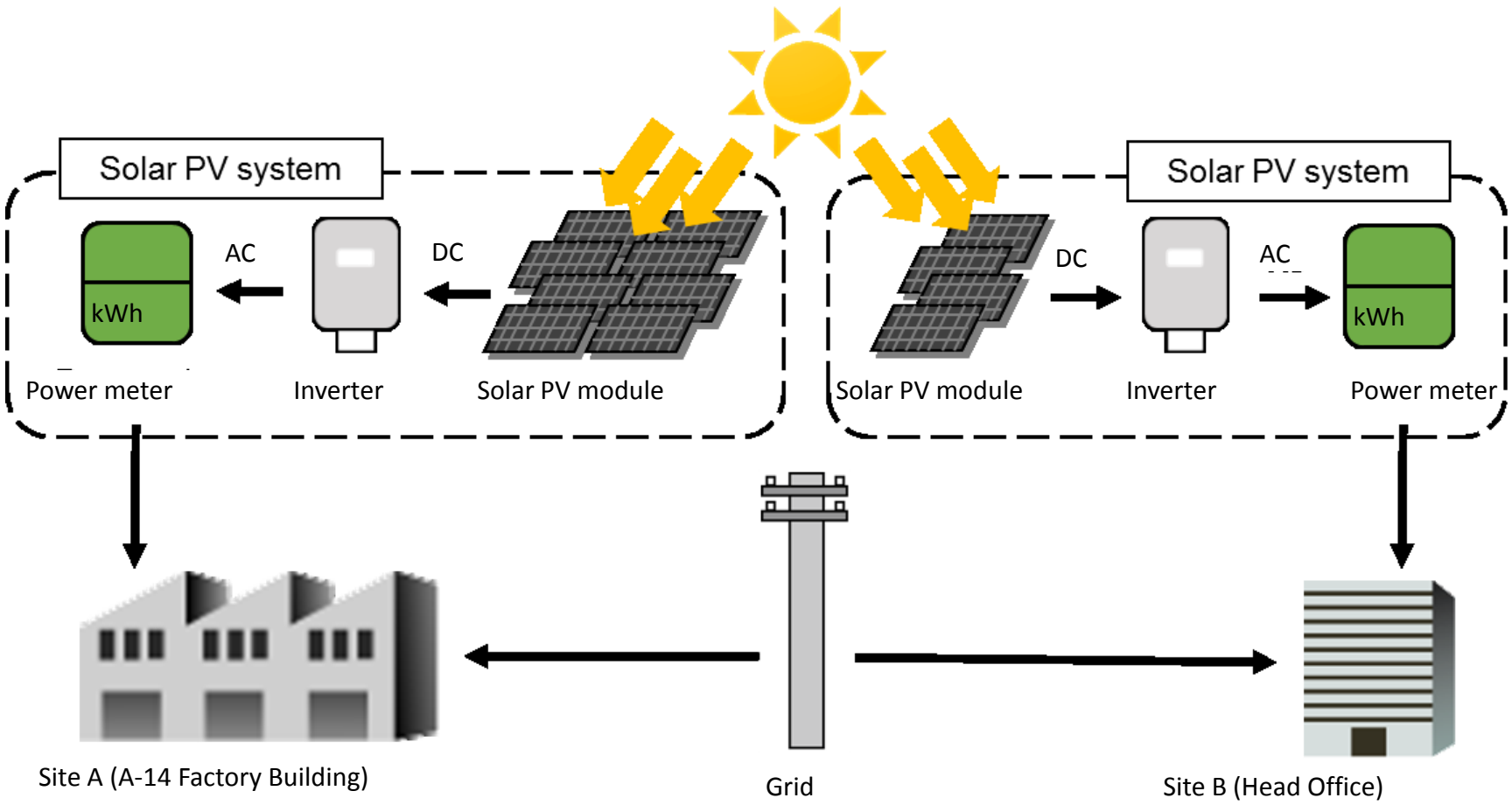
$$ER_p = RE_p - PE_p$$

ER_p : Emission reductions during the period p [tCO_2/p]

RE_p : Reference emissions during the period p (tCO_2/p)

PE_p : Project emissions during the period p (tCO_2/p)

JCM Methodologies: TH_AM001
Installation of Solar PV System



JCM Methodologies: TH_AM001
Installation of Solar PV System

Calculation of project emissions

$$PE_p = 0$$

PE_p : Project emissions during the period p (tCO_2/p)

Calculation of reference emissions

$$RE_p = \sum_i EG_{i,p} \times EF_{RE}$$

RE_p : Reference emissions during the period p (tCO_2/p)

$EG_{i,p}$: Quantity of the electricity generated by the project solar PV system i during the period p (MWh/p)

EF_{RE} : Reference CO_2 emission factor of grid electricity and captive electricity (tCO_2/MWh)

JCM Methodologies: TH_AM002

Energy Saving by Introduction of Multi-Stage Oil-Free Air Compressor

- Multi compression stage for higher energy efficiency
- Oil-free for clean working environment

JCM Methodologies: TH_AM002

Energy Saving by Introduction of Multi-Stage Oil-Free Air Compressor

Calculation of project emissions

$$PE_p = \sum_i \left(EC_{PJ,i,p} \times EF_{elec} \right)$$

PE_p : Project emissions during the period p (tCO_2/p)
$EC_{PJ,i,p}$: Power consumption of project air compressor i during the period p (MWh/p)
EF_{elec} : CO_2 emission factor for consumed electricity (tCO_2/MWh)

Calculation of reference emissions

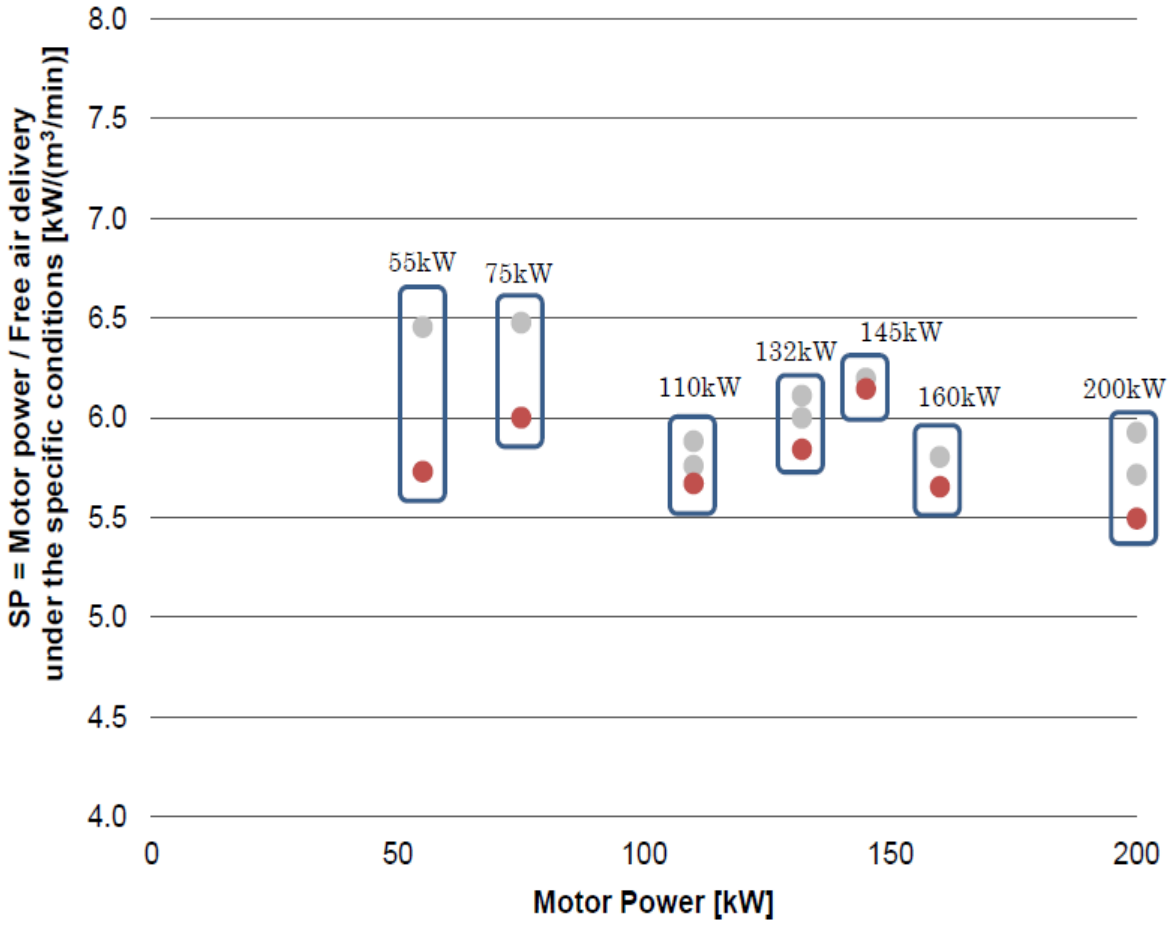
$$RE_p = \sum_i \left[EC_{PJ,i,p} \times \left(SP_{RE,sc,i} \div SP_{PJ,sc,i} \right) \times EF_{elec} \right]$$

RE_p : Reference emissions during the period p (tCO_2/p)
$EC_{PJ,i,p}$: Power consumption of project air compressor i during the period p (MWh/p)
$SP_{RE,sc,i}$: SP of reference air compressor i under the specific conditions ($kW \cdot min/m^3$)
$SP_{PJ,sc,i}$: SP of project air compressor i calculated under the specific conditions ($kW \cdot min/m^3$)
EF_{elec} : CO_2 emission factor for consumed electricity (tCO_2/MWh)

JCM Methodologies: TH_AM002

Energy Saving by Introduction of Multi-Stage Oil-Free Air Compressor

Determination of the default reference SP values in a conservative manner



JCM Methodologies: TH_AM002

Energy Saving by Introduction of Multi-Stage Oil-Free Air Compressor

Requested revisions

Background and summery of revisions on TH_AM002

- Based on the comment from the JCM secretariat of Thai side, emission factor for captive generation with natural gas has been added in section I of the methodology

Before revision

For captive electricity, it is determined based on the following options:

a) 0.8*

*The most recent value available from CDM approved small scale methodology AMS-I.A at the time of validation is applied.

After revision

Note:

In case the captive electricity generation system meets all of the following conditions, the value in the following table may be applied to EF_{elec} depending on the consumed fuel type.

- The system is non-renewable generation system
- Electricity generation capacity of the system is less than or equal to 15 MW

fuel type	Diesel fuel	Natural gas
EF_{elec}	0.8	0.46

JCM Methodologies: TH_AM003

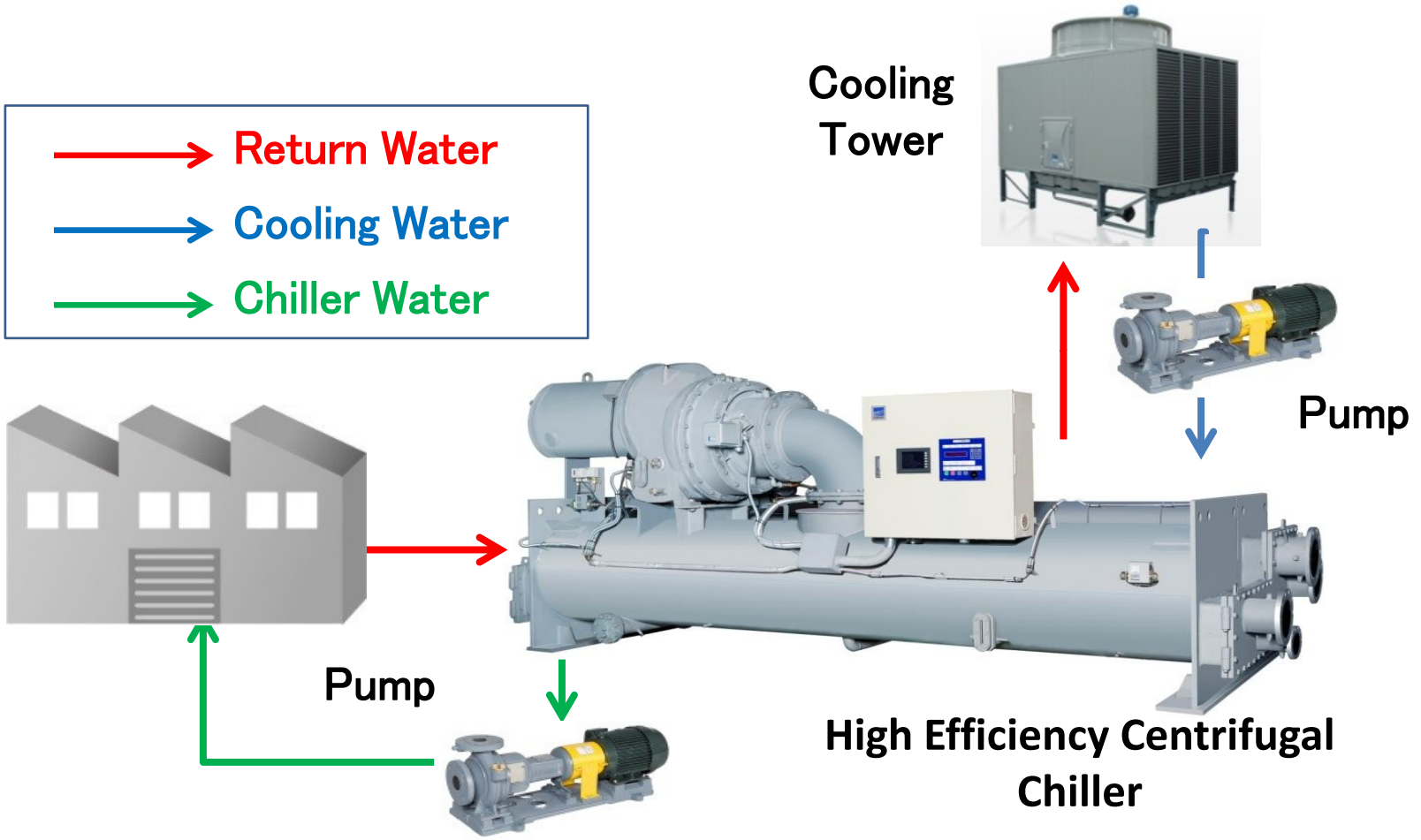
Energy Saving by Introduction of High Efficiency Centrifugal Chiller

■ High-efficiency centrifugal chiller for air conditioning

- High COP (high energy efficiency)
- ODP of the refrigerant (HFC-134a) used is zero for the ozone layer protection

JCM Methodologies: TH_AM005

Energy Saving by Introduction of Non-Inverter High Efficiency Centrifugal Chiller



JCM Methodologies:

TH_AM003: Energy Saving by Introduction of High Efficiency Centrifugal Chiller
TH_AM005: Energy Saving by Introduction of Non-Inverter High Efficiency Centrifugal Chiller

Calculation of project emissions

$$PE_p = \sum_i \left(EC_{PJ,i,p} \times EF_{elec} \right)$$

PE_p : Project emissions during the period p (tCO_2/p)
$EC_{PJ,i,p}$: Power consumption of project chiller i during the period p (MWh/p)
EF_{elec} : CO_2 emission factor for consumed electricity (tCO_2/MWh)

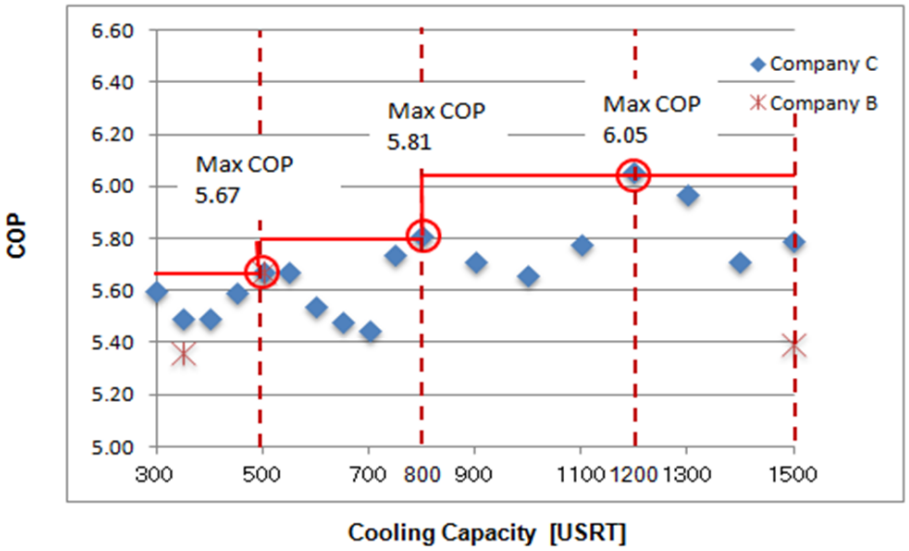
Calculation of reference emissions

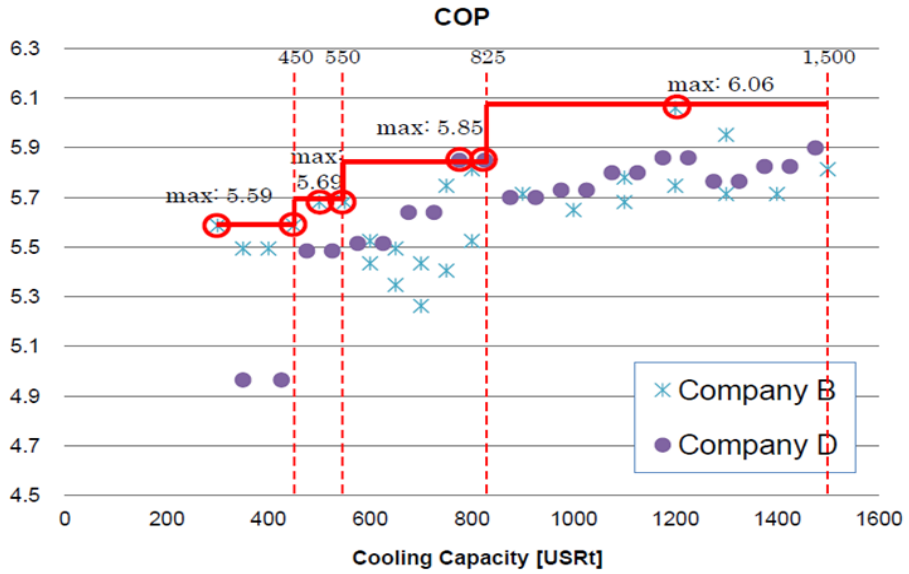
$$RE_p = \sum_i \left[EC_{PJ,i,p} \times \left(COP_{PJ,tc,i} \div COP_{RE,i} \right) \times EF_{elec} \right]$$

RE_p : Reference emissions during the period p (tCO_2/p)
$EC_{PJ,i,p}$: Power consumption of project chiller i during the period p (MWh/p)
$COP_{PJ,tc,i}$: COP of project chiller i calculated under the standardizing temperature conditions (-)
$COP_{RE,i}$: COP of reference chiller i under the standardizing temperature conditions (-)
EF_{elec} : CO_2 emission factor for consumed electricity (tCO_2/MWh)

JCM Methodologies:

TH_AM003: Energy Saving by Introduction of High Efficiency Centrifugal Chiller
TH_AM005: Energy Saving by Introduction of Non-Inverter High Efficiency Centrifugal Chiller





COP values of inverter type centrifugal chiller marketed in Thailand

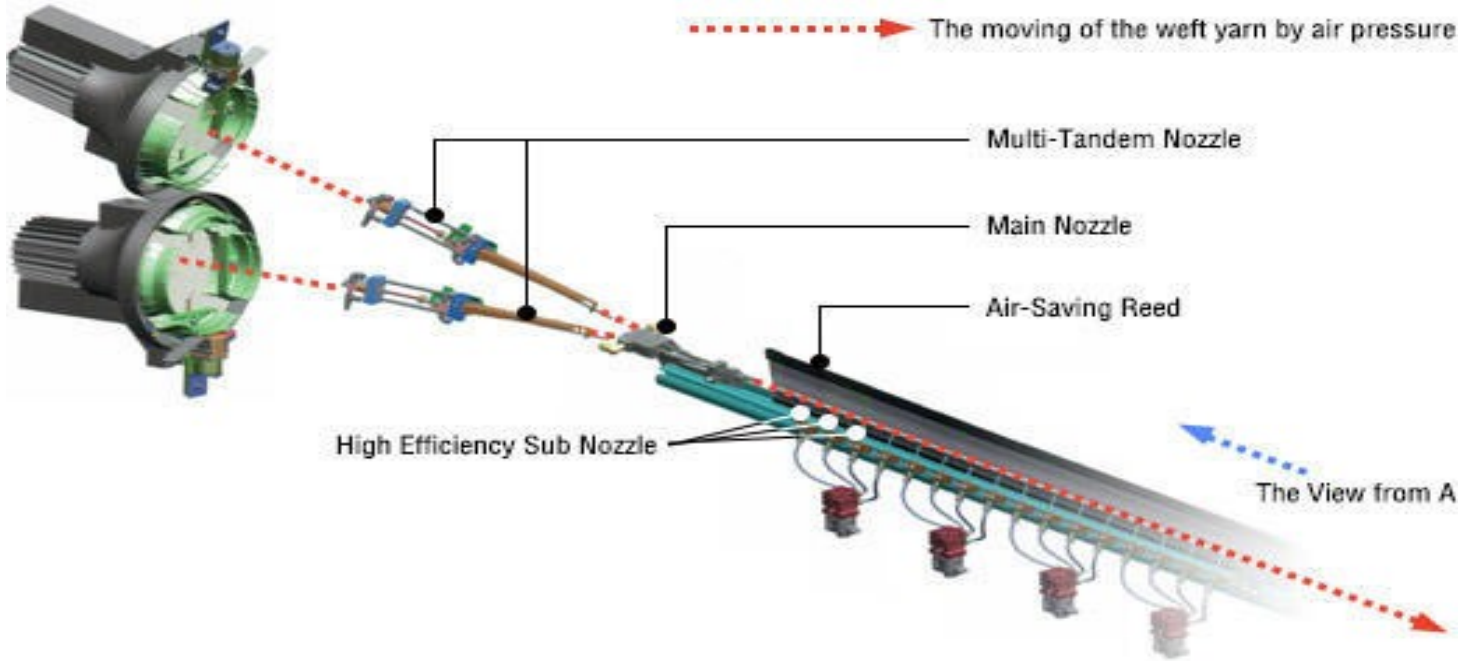
Cooling capacity per unit (USRt)	300≤x<500	500≤x<800	800≤x≤1500
Threshold COP value	5.67	5.81	6.05

	Cooling capacity per unit (USRt)			
	300≤x≤450	450<x≤550	550<x≤825	825<x ≤1,500
Threshold COP value	5.59	5.69	5.85	6.06

JCM Methodologies: TH_AM004

Installation of Energy Saving air Jet Loom at Textile Factory

Energy saving air jet loom " Toyota JAT810" produced by Toyota Industries Corporation



Air-Jet weft insertion system

JCM Methodologies: TH_AM004
Installation of Energy Saving air Jet Loom at Textile Factory

Calculation of project emissions

$$PE_p = \sum_j \left(SEC_j \times \sum_i \left(SAC_{PJ,i,j} \times AP_{PJ,i,j,p} \right) \times EF_{elec,j} \right)$$

PE_p : Project emissions during the period p (tCO_2/p)

SEC_j : Specific electricity consumption of the air compressors at the project factory j (kWh/Nm^3)

$SAC_{PJ,i,j}$: Specific air consumption of the project air jet loom type i at the project factory j (Nm^3/m)

$AP_{PJ,i,j,p}$: Amount of fabric woven at the project air jet loom type i at the project factory j during the period p (m/p)

$EF_{elec,j}$: CO_2 emission factor for consumed electricity at the project factory j (tCO_2/MWh)

JCM Methodologies: TH_AM004
Installation of Energy Saving air Jet Loom at Textile Factory

Calculation of reference emissions

$$RE_p = \sum_j \left(SEC_j \times \sum_i (SAC_{PJ,i,j} \times AP_{PJ,i,j,p}) \div \left(1 - \frac{RR_{i,j}}{100}\right) \times EF_{elec,j} \right)$$

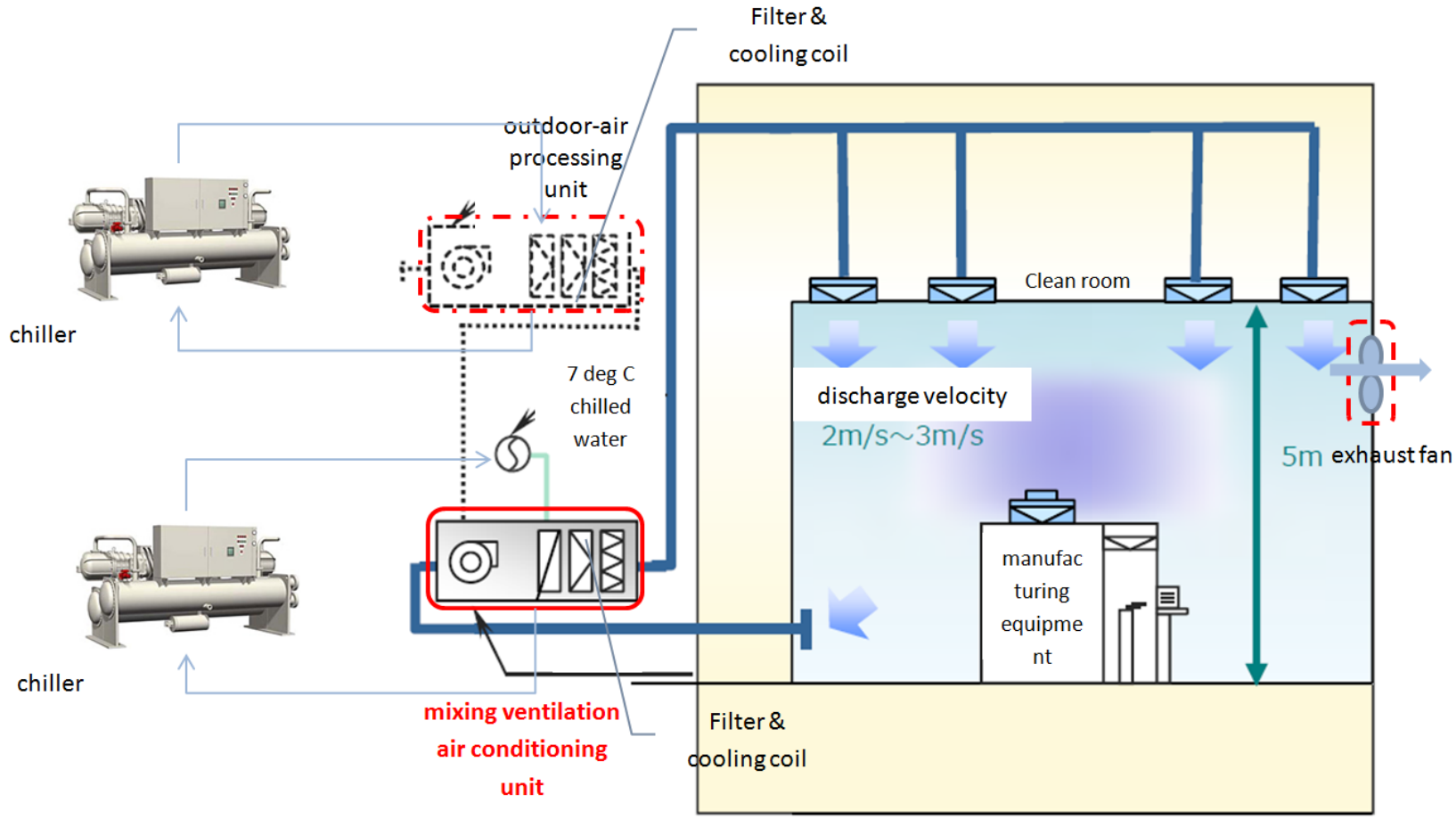
Where:

RE_p	: Reference emissions during the period p [tCO_2/p]
SEC_j	: Specific electricity consumption of the air compressors at the project factory j [kWh/Nm^3]
$SAC_{PJ,i,j}$	: Specific air consumption of the project air jet loom type i at the project factory j [Nm^3/m]
$RR_{i,j}$	: Reduction rate of specific air consumption of the project air jet loom type i at the project factory j [%]
$AP_{PJ,i,j,p}$	: Amount of fabric woven by the project air jet loom type i at the project factory j during the period p [m/p]
$EF_{elec,j}$	: CO_2 emission factor for consumed electricity at the project factory j [tCO_2/kWh]
i	: Identification number of the project air jet loom type, differentiated according to, for example, models
j	: Identification number of the project factory

JCM Methodologies: TH_AM006

Installation of Displacement Ventilation Air Conditioning Unit in the Cleanroom of Semiconductor Manufacturing Factory

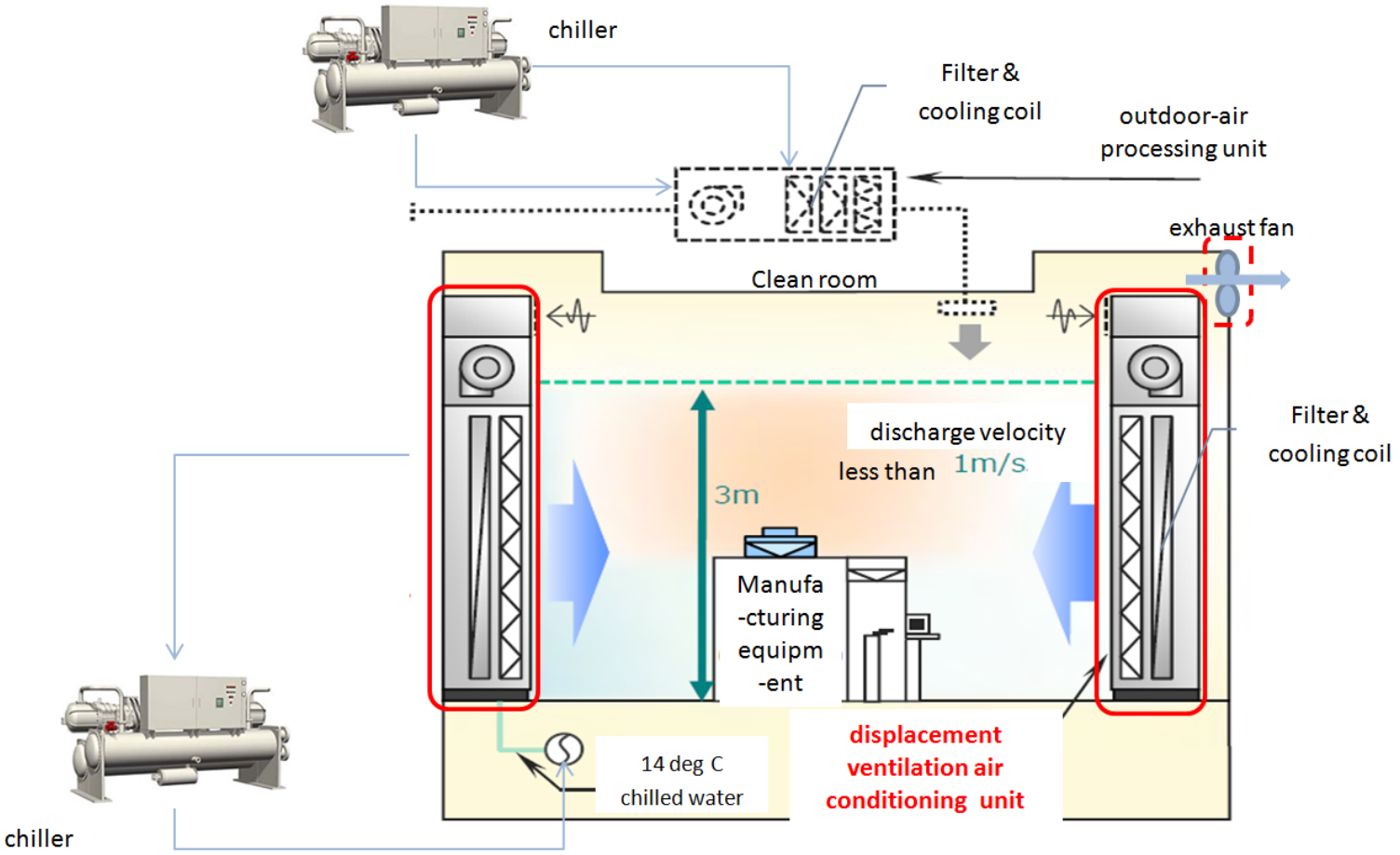
Outline of the reference technology



JCM Methodologies: TH_AM006

Installation of Displacement Ventilation Air Conditioning Unit in the Cleanroom of Semiconductor Manufacturing Factory

Outline of the technology applied



JCM Methodologies: TH_AM006

Installation of Displacement Ventilation Air Conditioning Unit in the Cleanroom of Semiconductor Manufacturing Factory

Calculation of project emissions

$$PE_p = \sum_i \sum_j \sum_k \left(EC_{PJ,DV,i,j,k,p} \times EF_{elec,k} \right)$$

PE_p : Project emissions during the period p (tCO_2/p)

$EC_{PJ,DV,i,j,k,p}$: The amount of power consumption by the displacement ventilation air conditioning unit i in cleanroom j of the project factory k during the period p (MWh/p)

$EF_{elec,k}$: CO_2 emission factor for consumed electricity in the project factory k (tCO_2/MWh)

i : Identification number of the displacement ventilation air conditioning unit

j : Identification number of the cleanroom

k : Identification number of the factory

JCM Methodologies: TH_AM006

Installation of Displacement Ventilation Air Conditioning Unit in the Cleanroom of Semiconductor Manufacturing Factory

Calculation of reference emissions

$$RE_p = \sum_i \sum_j \sum_k \left(EC_{PJ,DV,i,j,k,p} \times \frac{L_{RE,j,k}}{L_{PJ,j,k}} \times EF_{elec,k} \right)$$

RE_p : Reference emissions during the period p (tCO_2/p)

$EC_{pJ,DV,i,j,k,}$: The amount of power consumption by the project displacement ventilation air conditioning unit i in cleanroom j of the project factory k during the period p (MWh/p)

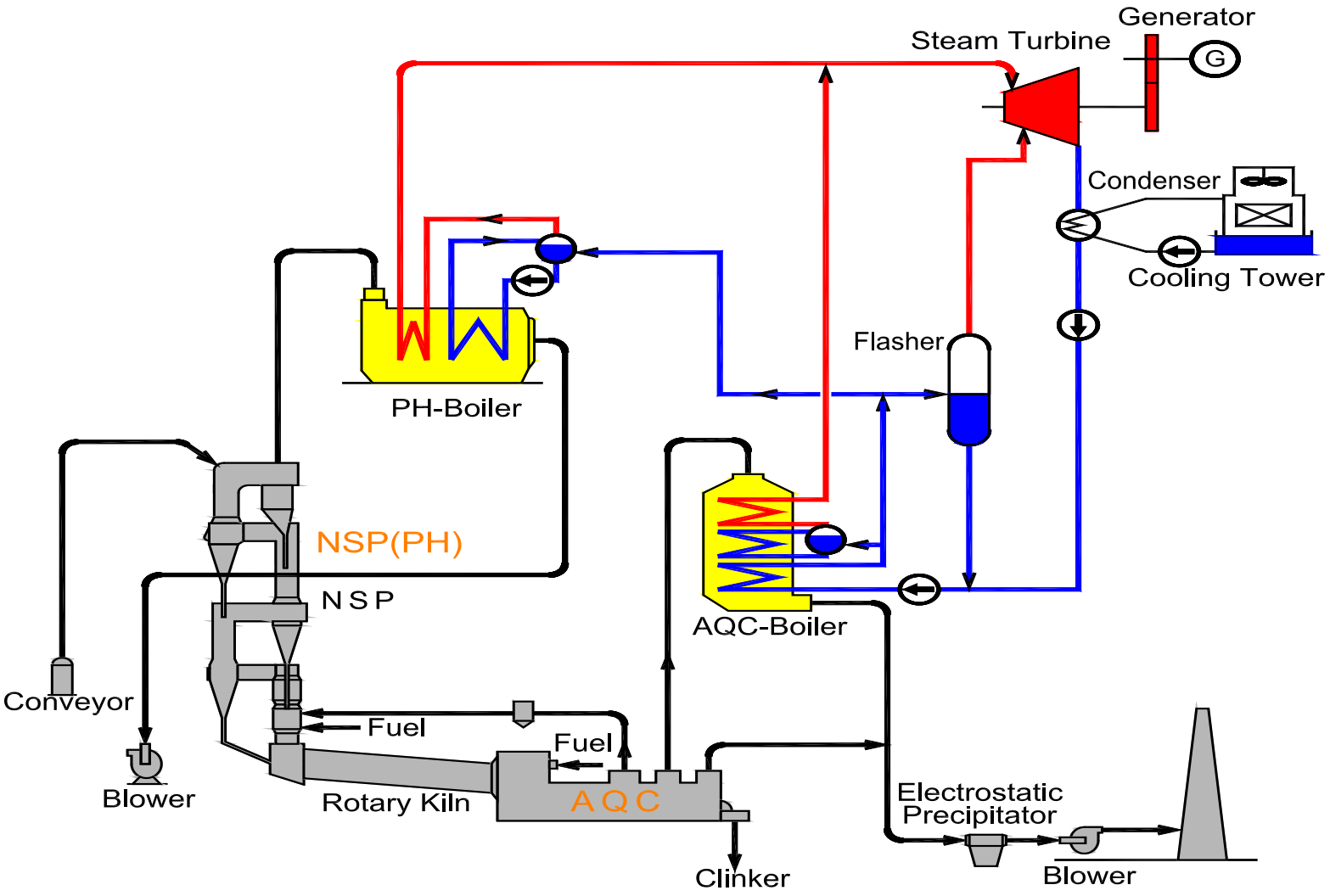
$L_{RE,i,p}$: Motive power of reference mixing ventilation air conditioning unit(s) supplying air to cleanroom j in the project factory k (kW)

$L_{PJ,i,p}$: Motive power of project mixing ventilation air conditioning unit(s) supplying air to cleanroom j in the project factory k (kW)

$EF_{elec,k}$: CO_2 emission factor for consumed electricity in the project factory k (tCO_2/MWh)

JCM Methodologies: TH_AM007

Power Generation by Waste Heat Recovery in Cement Industry



JCM Methodologies: TH_AM007
Power Generation by Waste Heat Recovery in Cement Industry

Calculation of project emissions

$$PE_p = 0$$

PE_p : Project emissions during the period p [tCO_2/p]

JCM Methodologies: TH_AM007
Power Generation by Waste Heat Recovery in Cement Industry

Calculation of reference emissions

$$RE_p = EG_p \times EF_{elec}$$

RE_p : Reference emissions during the period p [tCO_2/p]

$EG_{i,p}$: The quantity of net electricity generation by the WHR system during a given time period p [MWh/p]

EF_{elec} : CO_2 emission factor for consumed electricity [tCO_2/MWh]

$$EG_p = EG_{SUP,p} - EC_{AUX,p}$$

$EG_{SUP,p}$: The quantity of the electricity supplied from the WHR system to the cement production facility during a given time period p [MWh/p]

$EC_{AUX,p}$: The quantity of electricity consumption by the WHR system except for the direct captive use of the electricity generated by itself during a given time period p [MWh/p]

$$EC_{AUX,p} = EC_{CAP} \times 24(hours/day) \times D_p$$

EC_{CAP} : The total maximum rated capacity of equipment of the WHR system which consumes electricity except for the capacity of equipment which use the electricity generated by itself directly [MW]

D_p : The number of days during a given time period p [day/p]

Proposed JCM Methodologies

Title
Installation of inverter-controlled air conditioning system for convenience store
Installation of inverter-controlled separate type fridge showcase for convenience store
Installation of gas engine cogeneration system to supply electricity and heat
Introducing heat recovery heat pumps for the food manufacturing industries
Energy Saving by Introduction of High Efficiency Once-through Boiler or/and Installation of Economizer into Existing Boiler

Designation of Third-Party Entities (TPEs)

Company name	Designated date	1. Energy industries	2. Energy Distribution	3. Energy demand	4. Manufacturing industries	5. Chemical industry	6. Construction	7. Transport	8. Mining/mineral production	9. Metal production	10. Fugitive emissions from fuels	11. Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	12. Solvent use	13. Waste handling and disposal	14. Afforestation and reforestation	15. Agriculture
Lloyd's Register Quality Assurance Limited (LRQA)	23 Aug 2016	❍ ●	❍ ●	❍ ●				❍ ●						❍ ●		
Bureau Veritas Certification Holding SAS (BVC)	23 Aug 2016	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●	❍ ●
Japan Quality Assurance Organization (JQA)	21 Aug 2017	❍ ●		❍ ●	❍ ●	❍ ●					❍ ●			❍ ●	❍ ●	
Japan Management Association (JMA)	21 Aug 2017	❍ ●	❍ ●	❍ ●											●	

❍ **Validation** ● **verification**

Registered JCM project

Project_ code	Title	Registration date	Expected greenhouse gas emission reduction (tCO_2e/y)
001	Introduction of Solar PV System on Rooftops of Factory and Office Building	21 Aug 2017	440
002	Reducing GHG Emission at Textile Factory by Upgrading to Air-saving Loom (Samutprakarn)	20 Apr 2018	253
003	Installation of High Efficiency Air Conditioning System and Chillers in Semiconductor Factory	20 Apr 2018	3,327
004	Energy Saving for Semiconductor Factory with High Efficiency Centrifugal Chiller and Compressor	20 Apr 2018	324

Issuance of Carbon credits

Project _code	Title	Registration date	Expected greenhouse gas emission reduction (tCO_2e/y)	Received carbon credit date	Carbon credit issuance (tCO_2e)
001	Introduction of Solar PV System on Rooftops of Factory and Office Building	21 Aug 2017	440	20 Apr 2018	300 (20 Jun 16 – 1 Oct 17)

Thailand Greenhouse Gas Management Organization (Public Organization): TGO

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http://ghgreduction.tgo.or.th/jcm/