

## Clean Heat Training program

### General information

**Number of Training Days:** 5 Days

**Duration:** August 17th – August 21st

**Location:** KX Building, and Mechanical Engineering Department, KMUTT

**Scope & Form:** The class is taught full days from 9:00-17:00. The teaching will be a combination of lectures, Q&A sessions and project work.

**Evaluation:** Pre- and Post-tests, Assignment, Software simulations, and Physical experiments

### Clean Heat Curriculum

#### Day 1 (17<sup>th</sup> August 2026)

#### Module 1: Thermal System Engineering

	<b>Speakers:</b> Prof. Dr.-Ing. Horst Kreimes <b>Location:</b> KX Building, Bangkok
9:00 - 9:20	– Welcome and course introduction (20 min)
9:20 - 9:30	– Pre-test (10 min)
9:30 - 10:30	<b>Session 1: Introduction to Thermodynamics</b> – Fundamental thermodynamic principles (First and Second laws) (60 min) – Heat transfer mechanisms (Conduction, convection, radiation) – Basic energy concept (Energy efficiency and management)
10:30 - 10:45	Coffee break
10:45 - 12:00	– Heat exchanger fundamentals and design principles (75 min)
12:00 - 13:00	Lunch
13:00 - 14:30	<b>Session 2: Pinch Analysis</b> – Pinch analysis concept (30 min) – Composite curve construction and pinch point identification (Step-by-step procedure) (60 min)
14:30 - 15:30	– Heat exchanger network synthesis (60 min) – Case studies
15:30 - 15:45	Coffee break
15:45 - 16:45	– Assignment (60 min)
16:45 - 17:00	– Post-test (15 min)

**Day 2 (18<sup>th</sup> August 2026)****Module 2: Renewable Thermal Technologies**

	<b>Speakers:</b> Prof. Dr.-Ing. Horst Kreimes <b>Location:</b> KX Building, Bangkok
9:00 - 9:10	– Pre-test (10 min)
9:10 - 10:30	<b>Session 1: Waste heat recovery</b> – Characteristics of waste heat (Temperature, Sources/sector of waste heat) (80 min) – Technology solutions for using waste heat
10:30 - 10:45	Coffee break
10:45 - 12:00	– Applications for waste heat (e.g. drying processes in food and agro-industries) (75 min) – Case studies
12:00 - 13:00	Lunch
13:00 - 14:00	<b>Session 2: Industrial heat pump</b> – Working principles of heat pumps (60 min) – Heat pump types – Technological potential and limitations
14:00 - 15:00	– High temperature heat pumps (HTHP) in practice (60 min) <ul style="list-style-type: none"><li>• Component design for HTHP</li><li>• Safety and compliance</li></ul>
15:00 - 15:15	Coffee break
15:15 - 16:45	– Performance measurements (90 min) – Examples of practical experience in commercial and industrial sectors – Assignment
16:45 - 17:00	– Post-test (15 min)

**Day 3 (19<sup>th</sup> August 2026)****Module 3: Process Optimization and System Integration**

	<b>Speakers:</b> Dr. Yanin Sukjai, KMUTT <b>Location:</b> Mechanical Engineering Department, KMUTT, Bangkok
9:00 - 9:10	– Pre-test (10 min)
9:10 - 10:30	<b>Session 1: Optimization &amp; Integration</b> – Process integration of industrial heat pumps (80 min)
10:30 - 10:45	Coffee break
10:45 - 12:00	– Energy savings potential via pinch analysis and energy demand management (75 min) – Power management using demand response measures
12:00 - 13:00	Lunch
13:00 - 14:00	<b>Session 2: HTHP Workshop</b> – Laboratory visit : HTHP at KMUTT (30 min)
14:00 - 15:00	– Assignment I : Heat pump performance evaluation
15:00 - 15:15	Coffee break
15:15 - 16:15	– Assignment II : Energy saving /CO <sub>2</sub> reduction potential
16:15 - 16:30	– Post-test (15 min)

**Day 4 (20<sup>th</sup> August 2026)****Module 4: Energy Storage Systems**

	<b>Speakers:</b> Prof. Dr.-Ing. Horst Kreimes Dr. Siricharn Jirapongphan Dr. Pipat Chaiwiwatworakul <b>Location:</b> KX Building, Bangkok
9:00 - 9:10	– Pre-test (10 min)
9:10 - 10:30	<b>Session 1: Thermal energy storage</b> – Thermal energy storage (80 min)
10:30 - 10:45	Coffee break
10:45 - 12:00	– Energy storage density and performance metrics (e.g. MWh/m <sup>3</sup> , efficiency, discharge rate) (75 min)
12:00 - 13:00	Lunch
13:00 - 14:30	– CHILLOX thermal energy storage applied in building and cold storage (60 min) <b>Session 2: Financial analysis</b> <b>Speakers:</b> – Value of waste heat (30 min)
14:30 - 15:30	– Financial analysis and business models of heat pump (60 min) <ul style="list-style-type: none"><li>• CAPEX &amp; OPEX of HTHP</li></ul> – Break-even COP
15:30 - 15:45	Coffee break
15:45 - 16:45	– Economic analysis and viability of HTHP (60 min) – Levelized cost of heat for industrial process heat
16:45 - 17:00	– Post-test (15 min)

**Day 5 (21<sup>st</sup> August 2026)****Module 5: Policy and Market Frameworks for Clean Heat**

	<b>Speakers:</b> Prof. Dr.-Ing. Horst Kreimes Dr. Paweetida Sungwornpatansakul Dr. Sontaya Krichnavaruk <b>Location:</b> KX Building, Bangkok
9:00 - 9:10	– Pre-test (10 min)
9:10 - 10:30	<b>Session 1: Policy and Market Framework</b> (80 min) – Status of clean heat: An international outlook – Technical and economic barriers – Policy initiatives and actions to promote clean heat (German and EU clean heat standard)
10:30 - 10:45	Coffee break
10:45 - 12:00	– Clean heat policy in Asean countries (75 min)
12:00 - 13:00	Lunch
13:00 - 14:00	<b>Session 2: Carbon Trading</b> – Carbon trading scheme (60 min)
14:00 - 15:15	– Carbon emission assessment (75 min)
15:15 - 15:30	Coffee break
15:30 - 16:45	– Project assignment (75 min)
16:45 - 17:00	– Post-test (15 min)