



Current Situation of Energy Consumption of SMEs in Manufacturing Sector in Thailand

タイにおける中小企業への省エネ設備導入ポテンシャル調査

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New Energy and Industrial Technology Development Organization (NEDO)
by Mediator Co., Ltd. and The Energy Conservation Center of Thailand (ECCT)

- 1. Description of Thai SMEs**
- 2. Energy consumption of SME manufacturing industry**
- 3. The implementation of energy conservation measures in the SME industry**
- 4. Survey of demand for energy conservation**
- 5. The future prospect**

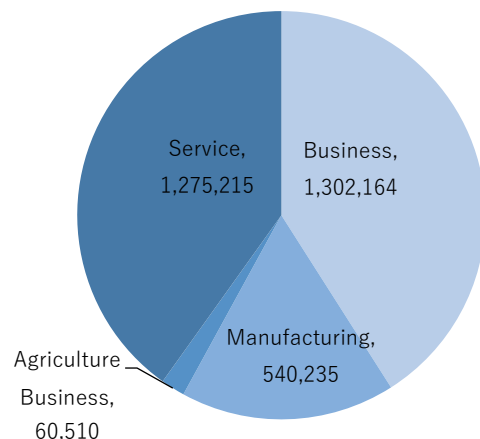
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1. Description of Thai SMEs

SME Promotion Act B.E. 2562 (2019)

- According to Ministerial Regulations on Designation of the Characteristics of **SME Promotion Act B.E. 2562 (2019)** and Announcement of the **Office of SME Promotion** Subject Designation of Characteristics of Micro Enterprises, MSMEs have been redefined on the basis of annual revenue and employment in order to be able to promote the targeted entrepreneurs effectively according to the current economic situation.
- As of year 2021, **3,178,124 enterprises** and businesses registered under the following sectors.

- Trading 1,302,164 (41 %)
- Manufacturing 540,235 (17 %)
- Agriculture Business 60,510 (2 %)
- Service 1,275,217 (40 %)



Size of SMEs	Manufacturing		Trade and Service	
	Number of Employee (Person)	Annual Revenue (Million Baht)	Number of Employee (Person)	Annual Revenue (Million Baht)
Medium Enterprise	≦ 200	≦ 500	≦ 200	≦ 300
Small Enterprise	≦ 50	≦ 100	≦ 30	≦ 50
Micro Enterprise	≦ 5	≦ 1.8	≦ 5	≦ 1.6

The Office of SMEs Promotion (OSMEP)

URL : <https://www.sme.go.th/en/index.php>

- OSMEP Strategic plan [Link](#)
- Thailand's MSME White Paper [Link](#)
- Annual report [Link](#)



1. Description of Thai SMEs



Business Registration

based on **Department of business development (DBD)**, Ministry of commerce Thailand. [Link](#)



96%
Small enterprises

548,353
companies

- Total revenues 16,032,415 THB (33%)
- Net loss 732,903 THB

- Although there are 3,178,124 enterprises, **769,208 companies** have filed their financial statements and have been identified as operating in Thailand.

2.4%
Medium enterprises

13,720
companies

- Total revenues 4,010,046 THB (8%)
- Net profit 275,034 THB

- Moreover, **22,830 enterprises** in 769,208 companies have a turnover of more than **50 million baht**, and medium sized enterprises are 13,720 companies in the enterprises.

1.6%
Large enterprises

9,110
companies

- Total revenues 27,709,980 THB (59%)
- Net loss 1,705,319 THB

- Therefore, the potential target in this project would be **13,720** of the medium sized and **9,110** of the large sized enterprises.

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Surveys on energy consumption and conservation measures of SMEs

Information on the use of energy in the manufacturing industry of SMEs has weakness on systematical formation preparation. Probably due to the large number of SMEs and their business diversion classification and complexity, unlike large industrial sectors.

It also includes some groups of manufacturers and entrepreneurs that are not registered in accordance with the actual production type make tracking cannot be done properly.

However, ECCT has information compiled from its surveys on energy consumption and conservation measures of **SME's which consumed energy below amount stipulated by the Energy Conservation Promotion Act as Designated Factory**, under DEDE sponsorship, during 2017 to 2021 which **numbers totaled to 228** and used them as representative in analyzing improvement measures and energy saving.



Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy

タイ国エネルギー省、代替エネルギー開発・効率局

The Department of Alternative Energy Development and Efficiency (DEDE) is a department of Thailand's Energy Ministry. It is responsible for driving Thailand's move to renewable energy production while reducing the nation's overall energy consumption.

URL: <http://weben.dede.go.th/webmax/> (EN)
<https://www.dede.go.th/main.php?filename=index> (TH)



The Energy Conservation Center of Thailand Energy Conservation Center of Thailand (ECCT)

タイ国、省エネルギーセンター

URL: <http://www.ecct-th.org/home.htm> (TH)

Surveys on energy consumption and conservation measures of SMEs

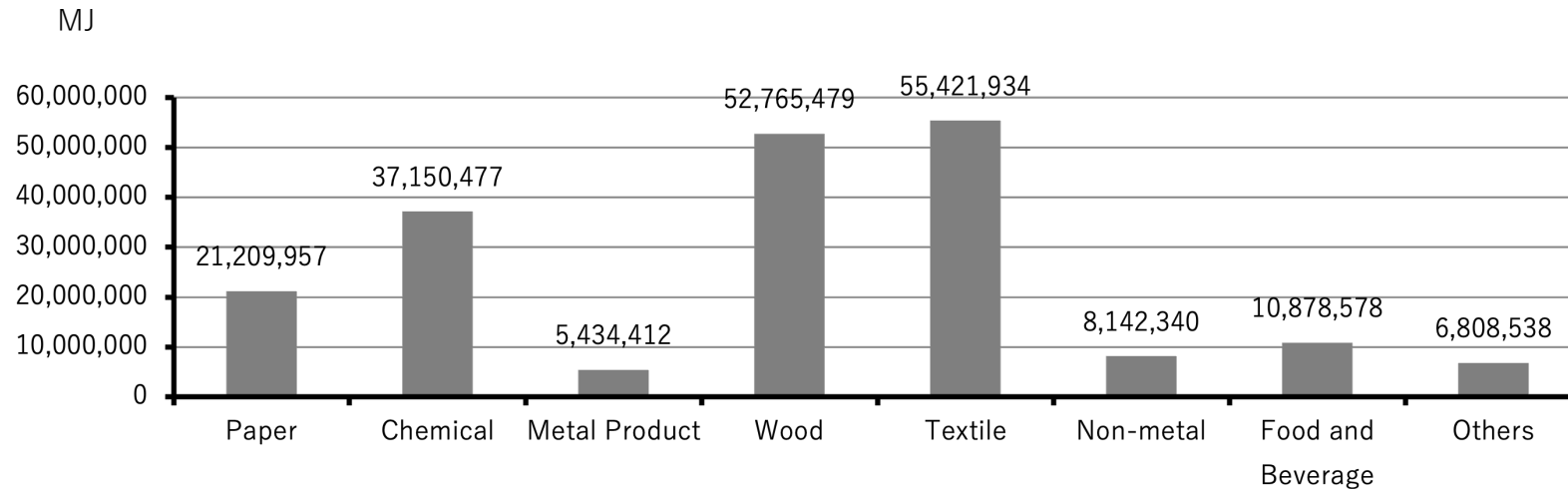
The following are the results of a study conducted by ECCT, commissioned by DEDE, for the period 2017-2021.

- The amount of energy used in SME industry different from those of large industry due to divergent production patterns and energy consumption rate.
- The use of electricity and fuel is not high while the large industry has complex production process and high output consumes more energy.
- The proportion of thermal energy used is greater than that of electricity.

No.	Type of Industry	Quantity (Factory)	Energy Consumption						Total		
			Electricity			Thermal			MJ/Year	toe/Year	(Baht/Year)
			(kWh/Year)	(toe/Year)	(Baht/Year)	(MJ/Year)	(toe/Year)	(Baht/year)			
1	Paper	9	8,425,887	718	33,344,939	160,556,422	3,800	26,894,970	190,889,615	4,518	60,239,908
2	Chemical	37	56,796,467	4,840	212,990,315	1,170,100,379	27,696	107,882,069	1,374,567,661	32,535	320,872,384
3	Metal Product	52	66,032,800	5,627	252,507,272	44,871,354	1,062	18,159,247	282,589,433	6,689	270,666,518
4	Wood	36	35,662,038	3,039	145,694,165	1,771,173,907	35,563	104,184,897	1,899,557,245	38,602	249,879,062
5	Textile	8	13,381,882	1,140	51,495,253	395,200,699	9,002	53,480,988	443,375,474	10,142	104,976,241
6	Non-metal	5	4,903,445	418	18,156,006	23,059,299	546	8,999,498	40,711,701	964	27,155,504
7	Food and Beverage	41	45,113,589	3,844	163,864,806	283,612,773	6,724	46,460,680	446,021,694	10,568	210,325,486
8	Others	40	36,084,277	3,075	144,346,160	142,438,138	3,049	29,660,037	272,341,534	6,124	174,006,197
	Total	228	266,400,385	22,700	1,022,398,915	3,991,012,971	87,442	395,722,386	4,950,054,357	110,142	1,418,121,301

Source : 'Promoting Energy Conservation in SME' project conducted by The Energy Conservation Center of Thailand Energy Conservation Center of Thailand (ECCT)

Surveys on energy consumption and conservation measures of SMEs



Average Total Energy Consumption in SME Industry

- Average **total energy consumption** per establishment in **textile factories** consumed highest energy at 55.4 million mega joules, followed by **wood** and **chemical** industries at 52.8 and 37.1 million mega joules respectively.
- Average **electricity** consumption per site in SME industry. The **textile industry** was the highest user with 1,672,735 kWh per year, followed by **chemicals** and **metal** products.
- Average **thermal energy** consumption per establishment in SME industries. The **textile industry** is the highest at 49,400,087 MJ/year, followed by **wood** and **chemicals**.

Source : 'Promoting Energy Conservation in SME' project conducted by The Energy Conservation Center of Thailand Energy Conservation Center of Thailand (ECCT)

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3. The implementation of energy conservation measures in the SME industry



Energy conservation measures

- Investigation on the implementation of projects related to energy use and conservation measures in 221 factories at the SME level revealed that the factories has carried out **586 measures**.
- Operations under past energy conservation projects focused on using various measures effectively reduce energy consumption in various main equipment, electrical and thermal.

No.	Type of Industry	Quantity	Energy Saving				Investment (Baht)	Payback Period (year)
			toe/year	kWh/year	MJ/year	Baht/year		
Electricity Measure								
1	Lighting system	119	89	1,029,386	0	4,098,766	3,704,751	4.76
2	Transformer system	17	12	144,254	0	570,785	63,000	1.20
3	Power Factor Improvements	37	28	333,883	0	2,248,973	2,236,728	4.42
4	Compressed air system	196	273	3,207,089	0	12,807,458	5,612,422	2.24
5	Moter and pump	38	99	1,165,922	0	4,402,909	3,005,700	2.83
6	Cooling and air conditioning system	46	66	772,185	0	2,950,092	5,995,050	11.47
7	Other machinery and equipment systems	29	62	730,365	0	2,852,308	2,748,438	3.74
8	Production system	1	0	3,788	0	15,949	5,000	0.31
9	Management system	22	43	507,240	0	1,969,304	266,700	0.30
	Total	505	674	7,894,113	0	31,916,545	23,637,789	0.74
Thermal Measure								
1	Boiler and furnace systems	64	637	0	33,240,436	3,096,845	1,416,018	3
2	Insulation system	17	81	0	5,610,156	856,601	348,022	2
3	Management system	0	0	0	0	0	0	0
	Total	81	717	0	38,850,592	3,953,446	1,764,040	0.45
	Grand Total	586	1,391	7,894,113	38,850,592	35,869,991	25,401,829	0.71

Source : 'Promoting Energy Conservation in SME' project conducted by The Energy Conservation Center of Thailand Energy Conservation Center of Thailand (ECCT)

3-1 Electricity Measure

	Energy Conservation System	Measure name
1	Lighting System	<ul style="list-style-type: none"> • The use of new high-efficiency lamps to replace the original lamps. • Changing fluorescent (FL) bulbs to LED bulbs. • Changing the moonlight bulbs to LED bulbs. • Replacing Metal Halide bulbs with LED bulbs. • Changing streetlights to LED solar cell bulbs • Changing tungsten halogen bulbs to LED bulbs. • Reducing the number of electric bulbs • Reduce the use of lighting in the corridor and place for the raw materials. • Using a switch to control the on-off of electric bulbs. • The use of thrust switches in the lighting system within the production area.
2	Transformer system	<ul style="list-style-type: none"> • The power factor improvement of the main transformer to be higher than that of the sub-transformer. • Voltage tap reduction to suit the load. • Disconnecting the transformer when unloaded. • Transformer load integration.
3	Power Factor Improvements	<ul style="list-style-type: none"> • Attaching a Capacity Bank to a large device. • Use of Automatic Capacitor Bank • Power factor improvement. • Demand Control. • Installation of Power Factor Controller system.

3-1 Electricity Measure

	Energy Conservation System	Measure name
4	Compressed air system	<ul style="list-style-type: none"> • Compressed air pressure level control. • Reduction of compressed air leakage. • Measures to reduce compressed air leakage by replacing defective on-off valves. • Using a small air compressor instead of a large one. • Use a high-efficiency air compressor to replace the existing one. • Modifications to the compressed air supply piping system. • Reducing the air temperature before entering the air compressor. • Reduction in the amount of compressed air used for cleaning by installing air nozzles. • Measures to adjust the speed of the electric motor of the air compressor. • Option to activate a higher efficiency air compressor. • Reducing the intake air temperature of air compressor. • Compressed air tank installation • Discard the wrong type of compressed air. (cooling wind) • Reduce the idle operation of the pipe cutter. • Using a high-efficiency air gun. • Inverter installation to control the amount of compressed air according to the usage load. • Maintenance of the air compressor ventilation panel.

3-1 Electricity Measure

	Energy Conservation System	Measure name
5	Motor and Pump system	<ul style="list-style-type: none">• Using a variable speed drive (VSD) with the motor of the chilled water pump.• Install VSD variable speed device, ventilation fan.• Appropriate setting of motor on-off time.• Choosing the right size of ventilation fan.• Switching to a high-efficiency motor.• Proper load arrangement of the motor.• Adjusting the belt tension of the aluminum melting furnace blower motor.• Reduce the operating time of cooling tower fans.• Using inverter to control hydraulic pump motor• Replaced with a high-efficiency brine stirrer motor.• Belt tension adjustment• Change to use servo motor instead of ordinary motors in injection molding machines.• High efficiency oven motor replacement.

3-1 Electricity Measure

	Energy Conservation System	Measure name
6	Cooling and air conditioning system	<ul style="list-style-type: none"> • Adjustment of the coolant temperature of the water cooler. • The use of new high-efficiency air conditioners to replace the original ones. • Choosing to operate a high-efficiency water chiller is the main choice. • Measures to turn off the water chiller for draining the reactor during after work hours. • Operation load management to control the on-off of cooling tower fans. • Air conditioning maintenance and temperature set point increase • The use of a new high-efficiency cooling tower to replace the old one. • Increase Chiller cold water temperature from 9 C to 13 C (4 C increase). • Turn off the air conditioner. and idle machinery • Improve the chilled water pipe system of the chiller system to reduce the use of water pumps. • Using a chiller instead of an old split type air conditioner that has a long service life. • Reduced cold storage space for clutch plates. • Modification of the air conditioner to be highly efficient by installing Cooling pad. • Inverter installation at the chilled water pump set • Changing the cooling fan coil panel of the cold room. • Increase efficiency of ventilation compressor, water cooler. • To reduce the temperature of Soft water before entering the ice maker. • Optimization of modular machines. (Window/Split Type) • Improving the Auto door closing system for efficiency. • Reducing xthe air-conditioned production area by dividing the walls of the room.

3-1 Electricity Measure

	Energy Conservation System	Measure name
7	Other machinery and equipment systems	<ul style="list-style-type: none"> • Install LPG Vaporizer to boil gas • Application of solar power generation system. • Stop using the wood chipper. • Reducing the load on the ice maker. • Optimization of cooling equipment. (increasing the intensity of brine in ice packs) • Disabling the welding machine when not in use. • Switching to infrared heaters. in injection molding machine
8	Production system	<ul style="list-style-type: none"> • Changing the winding machine • Setting the temperature of the ironing machine heater. • Co-generation of energy using solar cells • Installation of the servo motor system of the hydraulic pump of the injection molding machine. • Change the high-performance CNC machine. • Optimization of injection machine performance.
9	Management system and campaign	<ul style="list-style-type: none"> • Installation of operation control circuits to reduce empty running. • Turn off the welding machine when not in use. • Moving the wood oven working time. • Moving the rice husk dryer working time

3-2 Thermal Measure

	Energy Conservation System	Measure name
1	Boiler and furnace systems	<ul style="list-style-type: none"> • Replacing the boiler. • Improving the efficiency of combustion of hot oil boiler fuel. • Use of liquid-to-liquid heat pumps. • Improving the efficiency of fuel combustion in boilers. • Reducing the amount of excess air (Excess Air) used in combustion. • Prevention of heat loss from steam pipes. • Reusing Condensate • Prevention of loss of heat energy from steam and heat equipment. • Reducing the amount of BLOW DOWN of the boiler. • Reducing the heat loss of the vulcanizer. • Increase the efficiency of the electric stove. • Increasing the boiler feed water temperature. • Reducing steam production pressure of the boiler. • Preventing steam loss from steam devices or steam traps. • Reduce the use of heater. • Improvement of steam leakage. • Improving the efficiency of steam traps. • Cutting off steam pipes in unused sections of the wood-burning room. • Control of feed water quality/blowing quantity appropriately. • Optimization of cooling tower cooling • Improving the efficiency of steam traps.

3-2 Thermal Measure

	Energy Conservation System	Measure name
2	Insulating equipment	<ul style="list-style-type: none"> • Steam pipe insulation • Insulation of heating equipment. • Insulating heaters for injection molding machines. • Insulating leather presses. • Thermal insulation of hardening furnaces. • Repairing a leaked Stream Trap. • Insulate the hot oil tank. • Replacing the furnace insulation.
3	Management system and campaign	<ul style="list-style-type: none"> • Determining the right on-off time. • Proper maintenance (Split Type) • Reduce the activation of the dryer (from 3 to 1 unit). • Moving the working time of the Hot oil machine • Boiler efficiency maintenance. • Install operation control circuit to reduce empty running. • Reduce the running of empty machines. • Production system management according to the type • Turn off the welding machine when not in use. • Switching to the electricity tariff. • Reducing the load on the ice maker

Summary

Most of the measures that have been implemented are the improvement of the main materials or the equipment that becomes normal practice in the factory. In order to improve their production efficiency, they would consider below ;

- Experts in the production process with in-depth specific advice.
- Advanced technologies e.g. digital AI example, for better competitive, low cost, and less labor intension.
- Arrangement of the favorable funding sources.

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Survey results and summary

In December 2022, ECCT conducted a survey adjustment of demand for energy conservation among small, medium and large enterprises.

43 factories responded the survey.

Capital

1,000 Million <	10 Factories
501-1,000 Million	5 Factories
101-500 Million	16 Factories
0-100 Million	3 Factories
Not describe	9 Factories

Employees

1,000 Person <	5 Factories
501-1,000 Person	10 Factories
101-500 Person	17 Factories
0-100 Person	9 Factories
Not describe	2 Factories

Summary

- 74.74% of the total number of factories that responded that they are very interested in energy conservation, indicating that **there is a need among the respondents for energy conservation.**
- The obstacles to developing energy conservation measures are “**procurement and introduction of new technologies and equipment** (86.05%)” “funding (60.47%)” and “human resource development”.
- However, 35 factories (81.40%) indicated that **financial support was not a problem.**
- Energy conservation measures that consider necessary are “**Compressed air system** (60.47%)” “**Motor and Pump system** (55.81%)” “**Cooling and air conditioning system** (44.19%)”.
- The need to introduce equipment or opportunities in the future was more likely to result in “**compensation from the manufacturer or seller** (76.74%)” than from a “**recognized or used brand** (58.14%)”.

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BCG Economy

Bio-Circular-Green Economy (BCG) model was introduced by the Thai Government as a strategy for the national development and post-pandemic recovery (The Secretariat of the Cabinet, 2021).

BCG model places emphasis on applying science, technology and innovation to turn Thailand's comparative advantage in biological and cultural diversity into competitive advantage, focusing on four strategic sectors, namely

- 1) agriculture and food
- 2) wellness and medicine
- 3) energy, materials and biochemicals, and
- 4) tourism and creative economy.

Related document

1. BCG Booklet (English version) [download](#)
2. BCG Action plan (English version) [download](#)
3. BCG in Action [download](#)

Source : National Science and Technology Development Agency (NSTDA) <https://www.bcg.in.th/eng/>



Summary

1. Japan needs to be more proactive in disseminating information about Japanese technology and products.

They still have a good impression of Japan, but it is only an old impression. Thai executives, managers and engineers receive little information about current Japanese technology and products in their daily work. It is necessary to actively disseminate Japanese technology and products by utilizing Thai distributor that have contacts with Thai company settlers.

2. Making more contacts directly with Thai companies is more effective than desk research and macro economic figures.

The number of government agencies involved in SMEs support measures is large and information is dispersed. In order to understand the needs of SMEs, it would be more effective to establish direct contacts with Thai companies and elicit the information necessary to propose technologies and products.

3. The ability to listen and make proposals is most important key for success.

In general, they tend to think that return on investment is more important first than the details of the technology. Therefore, more time should be allocated to hearing and make understand issues and needs when talking with Thai companies than to explaining technology and products. Also, when making proposals, investment and payback should be brought to the conclusion first.

Thank you