Sustainable Management of CO2

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CO₂ emission calculation conditions and definitions (SMC's calculation method)

- The amount of greenhouse gases emitted during the production of raw materials converted, into CO₂ emissions is displayed as [kg-CO₂e].
- Calculation by the LCI database

The LCI (life cycle inventory) data—which is a quantitative assessment of the amount of emissions emitted during a product's life cycle (production, usage, disposal, etc.) takes into account the amount of resources and energy used in each process as well as various environmental impacts

Source: LCI database IDEA version 2.3 (2019/12/27): National Institute of Advanced Industrial Science and Technology The Research Institute of Science for Safety and Sustainability's Research Laboratory for IDEA, Sustainable Management Promotion Organization

SMC's CO₂ Emission-Reducing Initiatives

Production process and product performance improvements with a focus on the environment

Over the past several years, SMC has continued to take on its social responsibility to seriously promote and support sustainability in order to minimize negative impacts to the environment.

SMC is always looking to develop newer and greener solutions with CO₂ reduction as a top priority as a leader in the field of pneumatics. One of the key components of our comprehensive approach is the designing of compact and lightweight products. Smaller, lighter products require less raw materials to make and less time to process. In addition, the products themselves use less energy. All of these efforts contribute to reduced CO₂ emissions.

SMC's fully integrated technical, production, and sales departments are able to respond to the needs of our customers from around the world with a shared goal of finding new methods to effectively protect the environment.

SMC's CO₂ emission-reducing initiatives also include the promotion of eco-friendly factories and products. In addition, SMC promotes the reduction of CO₂ emissions in our operations.



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CO2 Emission-Reducing Products

With SMC's use of topology optimization^{*1} in the design process, more compact, lightweight products can be realized compared with existing products, resulting in a large reduction in the amount of CO₂ emissions during production. In addition, these products can also contribute to energy saving and CO₂ reduction during usage.

*1 Topology optimization is the methodology of finding the most efficient design for an object on a mathematical and mechanical basis.



*2 For low wattage valves with power-saving circuit (Refer to page 18.)

The benefits of using compact, lightweight products:

By using compact products, you can **make** efficient use of factory space!

By using lightweight products, you can reduce tact time and **improve productivity!**

By using compact, lightweight products, you can minimize the size and weight of devices!

SMC

Eco-Products

SMC is dedicated to the production of environmentally friendly products that reduce environmental impacts. This is done from the design and development phases until the end of the product life cycle. With product assessments, we evaluate the environmental impact of our products in terms of resource savings (smaller, lighter), product longevity, energy savings, safety, variations, amount of packing materials, and waste disposal in order to develop environmentally sound products.

Resource-saving

No communication cables required. p.9

Weight: Up to 54% lighter p. 10





Long Service Life

Service life: 200 million cycles (Metal seal)



Energy saving

Power consumption reduced by 34% (Energy saving)*1



*1 Under the conditions shown on the Web Catalog

Air Saving

93% reduction in air consumption

(Under SMC's measurement conditions)

Air consumption reduced with an energy efficient vacuum pressure switch and ejectors.



87% reduction in air consumption

(Under SMC's measurement conditions)

Impact force increased with higher peak pressures that allows for a drastic reduction in air consumption and labor time.



Eco-Factory

SMC has implemented ISO 14001, the international standards related to environmental management, and began to make organizational efforts in implementing environmentally friendly and energy-saving measures at our factories since 1998 (acquired certification in December 1999).

Energy Consumption, CO₂ Emissions and Water Usage

The largest source of CO₂ emissions in SMC's business activities is from the use of electricity. SMC aims to reduce the emission of CO₂ through the combined effect of its steady energy-saving efforts.

Reduction of CO₂ emissions (intensity)





Proper Management of Chemical Substances

SMC strives to eliminate the use of CFCs by switching to alternatives with lower GWP values, and to reduce the overall use of chemical substances (through prevention of evaporation, prevention of removal, and reuse).

3,000 (t) 2,500 2,000 1,500 1,000 500 0 2015 2016 2017 2018 2019

Waste discharge





Chemical substance usage



Chemical substance discharge



About Specified Businesses

SMC is designated as a Specified Business under the Act on Rationalizing Energy Use. Furthermore, our Soka 1st Factory, Tsukuba 1st Factory, Tsukuba Technical Center, Kamaishi Factory, Kamaishi 4th Factory, Tono Factory and Yamatsuri Factory are designated as Designated Energy Management Factories as the energy consumption at each factory for a given business year is 1,500 kL (crude oil equivalent) or more.

② Specified Businesses and Designated Energy Management Factories are obliged to establish targets to reduce their energy consumption by 1% or greater per year, as well as to manage energy consumption on an organizational basis and submit periodic reports.

Reduction of Industrial Wastes

SMC practices strict waste sorting and promotes the 3Rs - Reduce, Reuse and Recycle. SMC sells computers and printers, which are no longer used, as material of value to recycle operators and reducing its waste disposal costs.

plastic waste
paper
vinyl chloride
rubber

noncombustible items
corrugated boards



Material Balance

Example of sorting

SMC keeps track of the environmental burdens generated through consumption of resources and energy during the design, development and manufacturing of its products.



*1 CO2 from production activities is the amount of CO2 emitted associated with energy usage.

*2 Recycle refers to the amount that is discharged as material of value and reused and/or recycled as materials and thermal energy.

Designated as a Large-Scale Facility

A regulation regarding annual energy consumption is stipulated in a plan to prevent climate change set forth under Saitama Prefecture's ordinance. Facilities with energy consumption that exceeds the equivalent of 1,500 kL of crude oil per year for three consecutive years are designated as a large-scale facility and are required to reduce their energy consumption. SMC's Soka 1st Factory was designated as a large-scale facility in FY2019 as its energy consumption exceeded the equivalent of 1,500 kL for three consecutive years in FY2016–2018

Initiatives at Each Factory

SMC uses flow switches, its own products, to monitor the air flow rates at each factory to enable early detection of air leaks due to equipment failure. SMC is also working on improving energy efficiency. Its effort include the use of mechanisms that automatically shut off the air source during plant downtime, which reduced the use of purge air*1 by 30% (compared to our conventional operation).

*1 The air used to discharge the remaining air from air pipes when a plant starts operation.

Green Procurement

SMC recognizes that conservation of the global environment is a common issue for all humanity and a matter that demands the consideration of management.

SMC will develop and supply environmentally friendly products in order to continually reduce the environmental burdens in accordance with its basic philosophy: "SMC strives to undertake environmental conservation activities through pneumatic technology that contributes to automation in all fields of industry in order to pass down a sustainable global environment to future generations".

As part of its initiatives, SMC conducts green procurement of products, materials, components, semi-finished goods, secondary materials, and packaging materials used in the design, development and production process.



Proposal for Air-saving System Contributes to CO2 emissions reduction

We will help you save energy.

The first step towards energy saving is understanding the current state of your factory. Improved awareness is key.

Did vou know that air equipment accounts for about 20% of all factory power consumption? Air blow is the main factor, responsible for over 40% of all air consumption, with actuators accounting for 14% and suction 9%. Improved air blow efficiency can be achieved by selecting optimally sized piping. Similarly, air saving can be achieved by device optimization.

By allowing SMC to check on the state of your factory, we will be able to provide you with equipment and facility improvement proposals, factory management training, and access to a wide range of other useful services.



- SMC promotes the reduction of packaging materials, repeated use and review of materials (selection of materials containing less amount of substances that generate toxic gas upon disposal).
- SMC gives consideration to the disposal of its products by improving decomposability and reducing of the variations of the materials used. SMC discloses to its customers information on the content and use of substances of concern in its products.

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During the production process CO2 Emission-Reducing Products

With SMC's use of topology optimization*¹ in the design process, more compact, lightweight products can be realized compared with existing products, resulting in a large reduction in the amount of CO₂ emissions during production.

In addition, these products can also contribute to energy saving and CO₂ reduction during usage.

*1 Topology optimization is the methodology of finding the most efficient design for an object on a mathematical and mechanical basis.

Cableless



Compact and Lightweight



JCQ Series



JCM Series



JSY Series



AF Series



JMGP Series



KQ2 Series



Comparison with existing products (Cableless) Example of CO2 Emissions Reduction 1

Communication cables not required

Reduced wiring labor, space savings, with minimized disconnection risk.



* The communication wiring distance refers to the actual wiring distance not the wireless communication distance. (The max. wireless communication distance is 10 m.)

Wireless System EX600-W Series

CO₂ emissions: Up to 46% reduction

- PP : Polypropylene
- PE : Polyethylene
- PVC : Polyvinyl chloride
- PUR : Polyurethane



* For details on CO2 emission calculation conditions (SMC's calculation method), refer to page 1.



With SMC's use of topology optimization in the design process, more space-saving, lightweight products can be realized with the same bore size and stroke as existing products.

Large reduction in the amount of CO₂ emissions during production

Overall length shortened



Existing product ø40 (CM2 series)

Lightweight



Compact Cylinder JCQ Series

CO ₂ emissions	1.06 kg-CO2e reduction (32% reduction)
Weight	31 g reduction (15% reduction)
Volume	16 cm ³ reduction (17% reduction)
Overall length	12.5 mm reduction (18% reduction)



* For details on CO2 emission calculation conditions (SMC's calculation method), refer to page 1.

Air Cylinder JMB Series

CO ₂ emissions	0.83 kg-CO2e reduction (28% reduction)
Weight	230 g reduction (42% reduction)
Volume	61 cm ³ reduction (29% reduction)
Overall length	26 mm reduction (18% reduction)

CO₂ emissions: 28% reduction

CO₂ emissions: 32% reduction



For details on CO₂ emission calculation conditions (SMC's calculation method), refer to page 1. *

Air Cylinder JCM Series

CO ₂ emissions	1.15 kg-CO2e reduction (31% reduction)
Weight	118 g reduction (33% reduction)
Volume	35 cm ³ reduction (27% reduction)
Overall length	34 mm reduction (20% reduction)



* For details on CO2 emission calculation conditions (SMC's calculation method), refer to page 1.

Air Cylinder JCM Series

CO ₂ emissions	3.07 kg-CO2e reduction (55% reduction)
Weight	198 g reduction (45% reduction)
Volume	55 cm ³ reduction (37% reduction)
Overall length	52 mm reduction (27% reduction)

JCM Series C75 Series 7.0 Amount of CO2 emissions during production [kg-CO2e] Surface Overall 6.0 5.63 treatment 0.20 5.0 Machining 0.65 55% reduction 4.0 Surface Overall 3.0 treatment 2.56 Material 0.11 4.78 2.0 Machining 0.19 Material 1.0 2.26 0 **JCDMM32-50** Part no. CD75E32-50-B CO₂ emissions 2.56 kg-CO2e 5.63 kg-CO2e 242 g Weight 440 g 93 cm³ Volume 148 cm³ Overall length 138 mm 190 mm

* For details on CO2 emission calculation conditions (SMC's calculation method), refer to page 1.



CO₂ emissions: 31% reduction

Compact Guide Cylinder JMGP Series

CO₂ emissions Weight

Volume

Overall length

CO₂ emissions

Cv

Weight

Valve width

CO₂ emissions: 39% reduction

1.23 kg-CO2e reduction (39% reduction)		J	MGP Serie	S		MGP Serie	s
207 g reduction (69% reduction) 49 cm³ reduction (58% reduction)		2	A		a cha	e and	* 69
13 mm reduction (23% reduction)	_ 4.0					0 .	
	ikg-CO ₂₆					Overall	
	0.6 duction			39%	T	Machining	- Surface treatmen
	ord 2.5 Bu		Overall	reduc	tion	0.50	0.24
	iunp 2.0	Surface -	1.92		•		
	1.5	treatment 0.09	Machining 0.63			Material	
	8 1.0					2.41	
	ont of		Material 1.20				
	0 Am				1		
Part no.			JMGPM16-10			MGPM16-102	Z
CO ₂ emiss	ions	1.92 kg-CO2e		3.15 kg-CO2e			
Weight		94 g		301 g			
Volume			35 cm ³			84 cm ³	
Overall leng	gth		43 mm			56 mm	

* For details on CO₂ emission calculation conditions (SMC's calculation method), refer to page 1.

CO₂ emissions: 5% reduction

5-Port Solenoid Valve JSY Series



* For details on CO2 emission calculation conditions (SMC's calculation method), refer to page 1.



One-touch Fittings KQ2 Series

CO₂ emissions: 31% reduction



* For details on CO2 emission calculation conditions (SMC's calculation method), refer to page 1.

CO₂ emissions: 1% reduction



* For details on CO2 emission calculation conditions (SMC's calculation method), refer to page 1.

Air Filter AF Series

standard-compliant products Example of CO2 Emissions Reduction 3

With SMC's use of topology optimization in the designing process, more space-saving, lightweight products can be realized compared with existing ISO standard-compliant products.

Large reduction in the amount of CO₂ emissions during production

SMC vs. ISO Standards

Comparison with ISO



SMC

Compact Cylinder JCQ Series

CO₂ emissions 0.96 kg-CO2e reduction (30% reduction) Weight 167 g reduction (49% reduction) Volume 51 cm³ reduction (40% reduction) Overall length 18.5 mm reduction (24% reduction)



CO₂ emissions: 30% reduction

CO₂ emissions: 50% reduction

ISO 15552 compliant JMB Series CP96 Series Amount of CO2 emissions during production [kg-CO2e] 5.0 Overall 4.17 Surface 4.0 treatment 50% 0.84 Machining 3.0 reduction 0.32 Surface Overall treatment 2.09 2.0 0.18 Material Machining 3.01 0.14 Material 1.0 1.77 0 CP96SDB32-50C Part no. JMDBB32-50 2.09 kg-CO2e CO₂ emissions 4.17 kg-CO2e 320 g Weight 600 g Volume 152 cm³ 249 cm³ Overall length 159 mm 196 mm

* For details on CO2 emission calculation conditions (SMC's calculation method), refer to page 1.

Air Cylinder JMB Series

CO ₂ emissions	2.08 kg-CO2e reduction (50% reduction)
Weight	280 g reduction (47% reduction)
Volume	97 cm ³ reduction (39% reduction)
Overall length	37 mm reduction (19% reduction)

SMC

Air Cylinder JCM Series **JCM** Series 2.29 kg-CO2e reduction (54% reduction) and the second 150 g reduction (38% reduction) 33.3 cm³ reduction (34% reduction) 6.0 56 mm reduction (30% reduction) 5.0 4.0 54% 3.0 reduction Surface Overall treatment 1.95 2.0 0.07

CO₂ emissions: 54% reduction

ISO 6432 compliant C85 Series



For details on CO₂ emission calculation conditions (SMC's calculation method), refer to page 1.

CO₂ emissions: 57% reduction

5-Port Solenoid Valve SY Series



* For details on CO2 emission calculation conditions (SMC's calculation method), refer to page 1.



CO₂ emissions

Weight

Volume

Overall length

Cv

Weight

The power-saving circuit can reduce CO₂ emissions (power consumption) when the device is energized.



Reduces power consumption when energized

Power consumption can be reduced by approx. 1/4 by reducing the wattage required to hold the valve in an energized state. (Effective energizing time is over 62 ms*¹ at 24 VDC.) Refer to the electrical power waveform as shown below.

Electrical power waveform with power-saving circuit



*1 SY/SYJ series

Low Wattage Valve

Energy-saving Product

		Power consumption W*2		
Туре	Model	Standard	With power- saving circuit	
	SJ1000/2000	0.55	0.23	
4/5-port	SJ3000	0.4	0.15	
	New SY3000/5000/7000	0.4	0.1	
	SY3000/5000/7000	0.4	0.1	
	JSY1000	—	0.2	
	JSY3000/5000	0.4	0.1	
	SYJ3000/5000/7000	0.4	0.1	
3-port	V100	0.4	0.1	
	SYJ300/500/700	0.4	0.1	
	VP300/500	0.4	_	
	VP700	1.55	0.55	

*2 With DC light



Corresponding value: Electricity unit ¥15/kWh, Power consumption - CO2 conversion factor 0.587 kg - CO2/kWh



Product CO₂ emissions by carbon footprint formula

SMC realizes the importance of calculating **not only the amount of greenhouse gasses emitted during the operation of a product but also those emitted during raw material procurement and production**. The total amount of emissions are then converted into CO₂ in order to find the total amount of CO₂ emitted by a product during its entire life cycle.



What is a carbon footprint?

The amount of greenhouse gasses (CH₄, N₂O, fluorocarbon, etc.) emitted from a product or service during its entire life cycle (from raw material procurement to disposal) converted and measured in CO₂ equivalents

Reference: LCA (life cycle assessment) is a methodology for assessing the environmental impacts (global warming, air pollution, energy depletion, etc.) associated with a product or service during its entire life cycle, whereas a carbon footprint only assesses the amount of greenhouse gas (CO₂) emissions.



SMC Support Program

By providing the latest pneumatic technology, SMC continues to create solutions for your automation needs.



An SMC Corporate Account Manager is assigned as your one-point person of contact. They work closely with your Corporate HQ Sponsors, Engineers and all production facilities - to deliver, create, manage and execute all collaborative program objectives.



SMC has over 6,000 local sales engineers in 83 countries to support all of your local production facilities.



To fully support your Engineers - SMC has 1600 dedicated R&D Engineers that can develop new products or solutions. SMC can quickly customize or modify existing components to meet design standards or unique applications.

With 12 support programs focusing on energy-saving activities



SMC has developed a Streamlined Energy Savings Assessment program for our Corporate Accounts. Our goal is to find innovative solutions to reduce waste of compressed air in the factory environment.



SMC will perform plant level machine analysis to improve machine performance, identify waste, reduce scrap rate and improve line efficiency.



SMC will perform plant level storeroom assessments to reduce vendor base, eliminate duplication, standardize components, identify critical spares and offer cost savings solutions.





SMC will work with your Engineering and local facilities for design assistance related to plant safety upgrades to meet ISO 13849-1 or other Machine Directives.



SMC will support your OEM Machine suppliers with the integration of SMC specified components. SMC will provide pricing support, innovative design assistance and SMC project management to ensure on-time delivery and commissioning of new machines or lines.



SMC will work with local factories receiving new OEM machines - to ensure all critical spare parts are available and onsite prior to production.





SMC will work with all local plants to identify high usage pneumatic components. SMC will conduct failure mode analysis and offer robust alternatives to ensure better performance and uptime on machines where components are used.



SMC will document all Corporate Account application successes with Improvement Activity Reports (IAR's). These IAR's are a one-page overview of the application - highlighting operational improvements, energy savings, cost savings details or plant process improvements. These IAR's are designed to be shared with other facilities to duplicate activity.

12 ONSITE & ONLINE TRAINING CLASSES

SMC offers customized onsite and online training classes - on a variety of subjects related to pneumatic components, electric actuators, energy savings, optimal machine design and TPM methodologies.







Akihabara UDX 15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, JAPAN Phone: 03-5207-8249 Fax: 03-5298-5362 https://www.smcworld.com © 2021 SMC Corporation All Rights Reserved