CS140 "Twin Action" street sweeper developed to clean urban and industrial areas

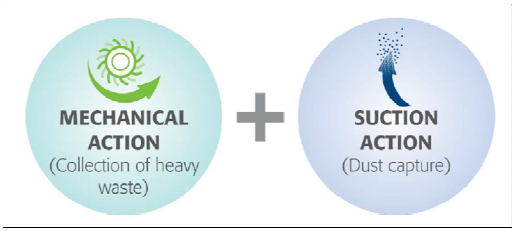
ADVANTAGES OF CS140 STREET SWEEPER, WHICH SWEEPS WITHOUT WATER

1) CS140 "TWINACTION" COMBINES THE PERFORMANCE OF TWO SWEEPERS IN ONE SINGLE MACHINE

Roads, parking lots and large squares are currently cleaned using **mechanical** or **suction** machines. These two systems are suitable for different types of cleaning: mechanical, machines are more suitable for heavier waste and suction machines are more suitable for lighter waste, therefore selection of one or the other inevitably entails a compromise in terms of resulting quality.
Consequently, for optimum cleaning both systems have to be used and currently two machines are required to obtain the two actions, thereby doubling times, costs and consumption.

CS140 "TwinAction" combines two actions to reach 100% cleaning quality

The exclusive “Twin Action System” designed and patented by Comac combines the strength of mechanical action to collect larger waste and the efficiency of the suction action for finer dust to provide excellent results, reducing water consumption and therefore increasing sweeper's range.



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2) CS140 "TWINACTION" STREET SWEEPER DOES NOT USE WATER

Both the main and the side brushes work in an area subject to strong suction, and then **without** water. The dust lifted up by the right brush is immediately drawn in, and fed into the intake channel, without dispersing into the surrounding environment.
The high suction power and airflow rate of CS140 (14.000 m^3/ h) brings significant benefits with regard to cleaning the ground and to filter the intake air using a filter surface to 50 m^2, more than double the other street sweepers.
This ensures the re-entry of the air into the environment without even the smallest particles (PM 10), but does not use water with all the problems and disadvantages set out below.

- Street sweepers to nebulize water for dust suppression on front / side brushes must use a hydraulic system made up of water tank, nozzles, various filters, pumps, pipes, fittings, valves: components, which can fail and requires frequent maintenance (limestone, solid residues in the filters).
- In winter months water circuit must be emptied to avoid, that it will freeze.
- Similarly in the case of road surface at temperatures below zero, it is dangerous to spray water, because ice sheets are formed immediately, with serious risks to the movement of cars and motorcycles.
- Waste hopper is loaded by wet dust, debris and nebulized water sprayed for dust suppression and the dumped weight includes the water content, with consequent waste discharge cost increase.
- Several stops for water tank refill and frequent maintenance on spray components and recycling water tank filters cleaning.
- Recycled water needs dedicated procedures and additional costs for special rubbish disposal.
- Part of the "suppressed" dust, wetted by nebulized water, is not removed, but "glued" to the ground only, where it stays after water evaporation.
- Sweepers carry on board between 400 and 700 litres of water, depending on the model, and this extra weight affects fuel consumption and tires wear.

CS140 street sweeper can sweep in any season without using water.
CS 140 doesn't waste yearly more than 100.000 water litres, like suction sweepers.
CS140 sweeper saves over € 10.000 per year for the water not dumped in waste disposal sites.

3) CS140 "TWINACTION" STREET SWEEPER SWEEPS UP TO 40 km/h

The CS140 urban sweeper, using the main brush only, can sweep up to a speed of 40 km/h, depending on ground and the type of debris on the road surface.
Its sweeping productivity (50.000 m^2/h) allows to reduce considerably the time of daily sweeping.

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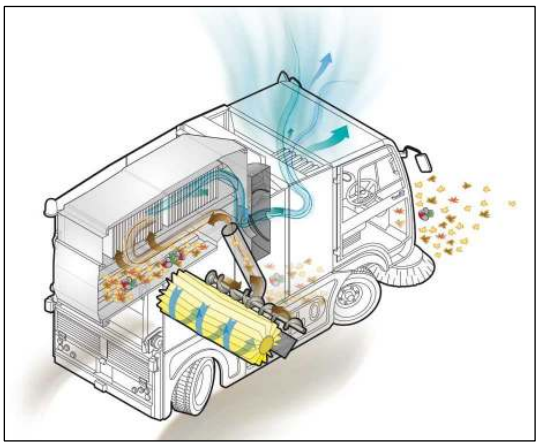
A sweeping machine designed to respect the environment

CS140 "TwinAction" ensures:

- Elimination of water use. In street sweepers water is used to suppress the dust raised by side brushes. In the CS140 side brushes are used only to remove waste along sidewalks or walls, while collection action is carried out by the main brush, working in an area under suction. This reduces the use of side brushes. Furthermore their location, adjacent to the main brush, enables the use of high vacuum to suck in any dust raised.
- Elimination of dust from the air returned to the environment thanks of the use of large size filter (50 m^2 surface), which is less susceptible to clogging, and with a highly efficient cleaning system which practically eliminates the need for maintenance.
- Reduction of noise level thanks to soundproof acoustic panels. In this way, while ensuring optimum accessibility, the noise of engine and suction turbine is significantly reduced.
- Reduction of fuel consumption and atmospheric emissions thanks to the high performance hydraulic system and the Perkins engine, specific for industrial applications, certified in accordance with the strictest atmospheric emissions standards in category.
- Greater operation comfort and reduction of stress even during the longest work shifts thanks to the position of the engine, located at the rear of the vehicle, the sound proof cab and the use of hydraulic suspensions.

FLEXIBILITY OF USE

The "TwinAction" system allows operation even on bumpy road surfaces: tree roots or protruding manholes are not a problem.
No rigid element (suction inlet support wheels or metallic holding plates) is in contact with the ground, therefore no breakage or excessive wear can occur during work; only the central brush touches the ground and thanks to its characteristics it follows the profile of the ground smoothly.
The hydraulic suspension system with independent electronic control also ensures the constant height of the machine from the ground in any working and waste hopper loading condition.



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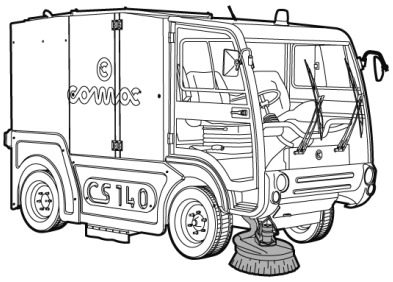
CS140 "TwinAction" changes the whole concept of the cleaning: the cleaning action is concentrated only on the central brush

In the street sweepers water is used to reduce the dust lifted up by the side brushes. On the CS140 sweeper side and translating brushes are used to remove dust along sidewalks or walls **only**, while the collecting action is carried out from the central brush, who works in an area under suction and then **without** water.

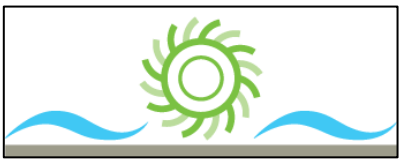


AUXILIARY SIDE AND TRANSLATING BRUSHES

The "TwinAction" street sweeper is equipped as standard with one Right side brush, whilst the Left and Translating ones are optional. In fact the new design of dust collection system, allows to reduce the use of side and translating brushes, to convey the dirt from the edges (curbs or walls) to the central area only, where the main brush works.
The side brush location near the central one and the high suction efficiency, grants sweeping **without** water for dust control. In very particular cases water can be used in small quantities and finely atomized.

With CS140 "TwinAction" suction is even possible in wet road conditions thanks to the filter "By Pass" system

The "By Pass" system allows deviation of the air flow in order to bypass the filter when working in wet road conditions, for example in the event of rain.
By selecting this mode, the flow of damp air, which is obviously dust-free, does not go through the filter, thus avoiding damage.



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Measurement of CS140 PM 10 emission in the environment

On the 14th and 15th September 2011 the Comac CS 140 road sweeper has undergone a series of four tests conducted by the **independent German SGS institute**, specialized in measuring fine PM10 (particles smaller than 10 µm) concentration in atmosphere.

Comac company, like all major European street sweeper manufacturers, belongs to the Association of European street sweeper manufacturers (EUnited Municipal Equipment). The Association, in order to give to end users an effective and objective criteria for distinguishing between the various road sweepers regard to their ability to avoid swirling up dust and ground sweeping efficiency, has commissioned SGS German institute to draw a rigorous testing protocol, to create the structure for testing and to conduct its measurements.

The results

The data provided by the Institute SGS have shown the exceptional performance of the CS140 "TwinAction" sweeper related to the minimum amount of dust dispersed in the action of sweeping and to the complete filtration of the air reintroduced in the environment.

These results indicate the ability of CS 140 to operate in urban areas, without raising or dispersing dust, combined to a very high sweeping efficiency.

Test	**Comac**
PM 10 concentration in the ambient	**0,89 mg/m^3**
Sweeping efficiency	**95%**

The Comac CS140 sweeper then passed all the tests and was enlisted into the first and more efficient category of sweepers (**"3 Stars"**).

http://www.eu-nited.net/municipalequipment/upload/PM_10_Flyer/EUnited_ME_PM10-Test_Flyer_final.pdf

Therefore all Comac CS140 "TwinAction" street sweepers are marked with the **"3 Stars" sticker PM 10** of EUnited Municipal Equipment to guarantee the perfect quality of sweeping.

It is also certified the ability to remove fine dust from the streets of our cities, thus contributing to the reduction of the amount of PM 10 and PM 2,5 in the air that we breathe every day.

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TECHNICAL DESCRIPTION	Unit	Technical Data
Working width		
Central brush working width	mm	1.400
Working width with two side brushes	mm	2.220
Working width with side brushes + third brush	mm	2.620
Cylindrical central brush diameter	mm	600
Side disc brushes diameter	mm	750
WASTE HOPPER		
Waste hopper volume	l	3.500
Max. hopper dumping height	mm	1.800
SUCTION		
Air flow	m^3/h	14.000
Filtering surface	m^2	50
Suction motor rated power	kW	45
PERFORMANCE		
Maximum speed	km/h	40
Maximum gradient (empty)	%	20
ENGINE		
Engine	-	Perkins
Fuel	-	Diesel
Engine power	HP/kW	100/75
Displacement	cm^3	4.400
Engine revolutions	rpm	2.000
DIMENSIONS AND WEIGHTS		
Machine length with RH side brush	mm	4.580
Machine width	mm	1.755
Machine height when in operation	mm	2.500
Machine height in transfer	mm	2.550
Machine height in highest position	mm	2.600
Machine weight in running order	kg	4.500
CHARACTERISTICS OF THE VEHICLE		
Turning radius	mm	4.250
Service brake	-	Hydraulic
Parking and emergency brake	-	Hydraulic
Rear wheel traction	-	Hydraulic
Wheels	-	205/65 R17,5
Suspensions	-	Hydraulic and independent
Machine height control	-	On all 4 wheels
Fuel tank capacity	l	105

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CHARACTERISTICS

THE FRAME

Sturdy frame, 8 mm thick, made of Fe360, designed in CAD-CAM and treated with sandblasting, rust epoxy and two subsequent coats of bi-component paint.

THE CYLINDRICAL CENTRAL BRUSH

CS140 "TwinAction" uses the central brush continuously, thereby ensuring higher quality cleaning because it is uniform for the entire width of the brush and higher productivity because it can clean more quickly than a conventional sweeping machine which has to use the two side brushes. It is available in various combinations of synthetic fibres or steel and has a diameter of 600 mm with a width of 1.400 mm. The technical solution adopted, such as the hydraulic support and the presence of the Polyurethane flaps, ensure a constant pressure on the ground for the brush independently of wear or terrain; the machine can also be positioned at 3 high levels allowing removal of different types of waste: leaves, pine needles, bottles, etc.

THE SUCTION TURBINE

Suction turbine is driven by an hydraulic motor with an air flow of 14.000 m^3/h. The air, sucked up from the ground, is channelled into a duct which is circular to reduce energy loss, and with a large diameter to allow the passage of larger waste, already reduced by the conveyor screws (augers).
The air flow and the material collected follow a path which slows the speed down causing the fall of the heavier dirt, reducing the quantity of particles which arrive at the filter.

THE CONVEYOR SCREWS

The screw conveyors consist of two steel shafts, both equipped with a spiral which, hydraulically moved, rotate on the same axis, conveying dirt and debris of different dimensions close to the suction outlet.
The screws are able to convey and reduce the volume of debris of various sizes.
A safety system intervenes in case of very large waste automatically reversing the direction of their rotation.

THE WASTE HOPPER

The total volume is approximately 3,5 m^3, a capacity which reduces the down time required for emptying and therefore also the total cleaning time. It is vertically divided in two parts the lower part is designed for collection of material while the upper part houses the filter. The waste hopper is emptied by lifting it on vertical guides up to 1.800 mm.
The lifting system, similar to that of forklift, allows significant reduction of stress on the frame und dumping at any intermediate height, according to the characteristics of the dumping area.

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THE FILTER

The filtering unit has a surface of 50 m^2 and is equipped with 2 filter shakers for cleaning. These characteristics, together with the choice of materials and the fact that the filter operates dry, virtually eliminate the need for routine maintenance; they also ensure the return of perfectly clean air into the environment. The filter is made of polyester and cotton and therefore comes under class L, with filtration capacity up to 5 µm. The large filtering surface and the efficiency of the dusty air intake distribution system over the entire surface ensure continuity of performance over time. For specific needs (dust with high temperature waste, fine dust) other materials are available (nomex, teflon).

The suspensions and the braking system guarantee driving in complete safety with excellent road holding, even when fully loaded

THE 4-WHEEL STEERING SYSTEM

CS140 "TwinAction" has an integral steering system on all 4 wheels with symmetrical front and rear angles (the same centre of rotation for the two axles) and turning circle of 4,25 m. Together with great manoeuvrability, even near walls or fences, and guarantee the necessary ease of handling to operate in places where the space is limited such as historical town centres or cluttered areas, at the same time guaranteeing maximum vehicle stability during transfer even at the highest speed.

THE SUSPENSIONS

The four independent suspensions, whose regulation and control is assigned to an electronic control unit, are hydraulic with McPherson system on all four-wheels.
Each wheel has a hydraulic cylinder and accumulator which ensure optimal absorption of road surface irregularities without using springs.

THE 3 WORKING HEIGHTS

Comac has produced a special device to control vehicle height from ground which, acting separately on the four wheels, maintains constant the height from the ground, optimizing work and stability. This device can also maintain the height of the vehicle unchanged even when the load varies. The operator can position the machine on three different pre-established levels in order to meet various needs:
- **WORKING POSITION**: the machine is in the lowest position with the rubber flaps close to the ground to avoid dust release.

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- **MOVING POSITION**: the machine is raised about 50 mm in order to avoid possible contact with the ground and therefore flap wear.

- **MAINTENANCE POSITION**: the machine is raised another 50 mm (beyond the moving position height) in order to facilitate replacement of central brush.

THE DRIVE

Traction is completely hydraulic, provided by two motors installed directly on the rear wheels and a variable capacity pump to adjust the speed from 0 to 40 km/h. Speed control is driven by means of two pedals, one for forward movement and the other for reverse. The manual adjustment of the diesel engine accelerator allows selection of the optimum rpm in order to reduce consumption according to the required level of performance.

THE BRAKES

CS140 has disc brakes on the front and drum brakes in the back. The negative type emergency and parking brakes also operate on rear wheels: the cut in and block the machine in the event of a breakdown or in the event of lack of pressure to the hydraulic braking system.

CS140 "TwinAction" is not afraid of continuous heavy-duty jobs, even for 8-hours non-stop

THE ENGINE

For the CS140 "TwinAction" the designers chose to install a Perkins motor, Industrial Open Power engine version, which is specially sized for continuous applications at constant speed with reduced consumption: for this reason it is suited for continuous heavy-duty work, even fir a daily cycle of eight hours non-stop. The solutions adopted (use concentrated on the central brush, possibly of adjusting suction and engine rpm) allow operation with minimum power and the lowest rpm, thus ensuring long engine life and low noise levels.
Perkins engine with displacement of 4.400 cc. provides therefore 100 HP (75 kW) at just 2.000 rpm. with maximum torque at 1.400 rpm.

THE COMFORT

THE CABIN

The cabin is comfortable because it is spacious and insulated with anti-vibration supports. It is comfortable to drive and the large windscreen provides maximum external visibility for the operator, making manoeuvring and control over the collection are easier. The activation commands, simple and intuitive are grouped on a central console. The others are on the front part of the roof, both easily accessible from the working position. On request the machine can be customized with climate control system, radio and useful colour camera which covers the rear of the machine in order to aid reversing and emptying operations, also allowing constant monitoring of cleaning effectiveness.

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THE MAINTENANCE

THE ACCESSIBILITY

Air filter is located in the rear of the machine and can be accessed by means of a door which can be opened even with the hopper lowered.
This position has been chosen to keep this part exposed to a flow of clean air.
For routine and extraordinary maintenance operations the hopper can be simply raised and locked in its highest position. In this way maintenance operations such as simple oil checks can be performed both on hydraulic and mechanical parts.

ENGINE COOLING WATER AND HYDRAULIC OIL RADIATOR

The radiator is positioned in the front part of the machine in an area protected from the presence of dust and easily accessible by tipping the cab.

OPTIONAL

	Air conditioning
	Radio with CD player
	Colour rear television camera
	Extending front brush Ø 750 mm
	Left side brush Ø 750 mm
	Atomizer system on brushes, complete with stainless steel water tank (220 litres)
	High pressure 100 bar washer spray gun (***together with atomizer system only***)
	Rear suction hose for manual collecting of debris: Ø 120 mm and length 5.000 mm

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