Sintec Optronics

Laser Cleaning Machines

Laser cleaning is the process of removing materials from surfaces using a laser beam. When the laser beam contacts a surface, light is absorbed by the surface. Upon reaching an ablation threshold, molecular bonds in the surface are broken and removed ("vaporized"). By utilising different ablation thresholds of the surface impurity layer and base substrate layer, selective cleaning can be achieved – the impurity layer can be removed while minimising the damages to the base layer.

Laser cleaning machines are mainly used for cleaning various metal surfaces with localized rust, paint, coatings, oil stains, oxide films, and other surface impurities. By selecting suitable operation mode and laser parameters, it can also be used for cleaning surfaces of non-metallic substrates such as ceramics, glass and composite materials.

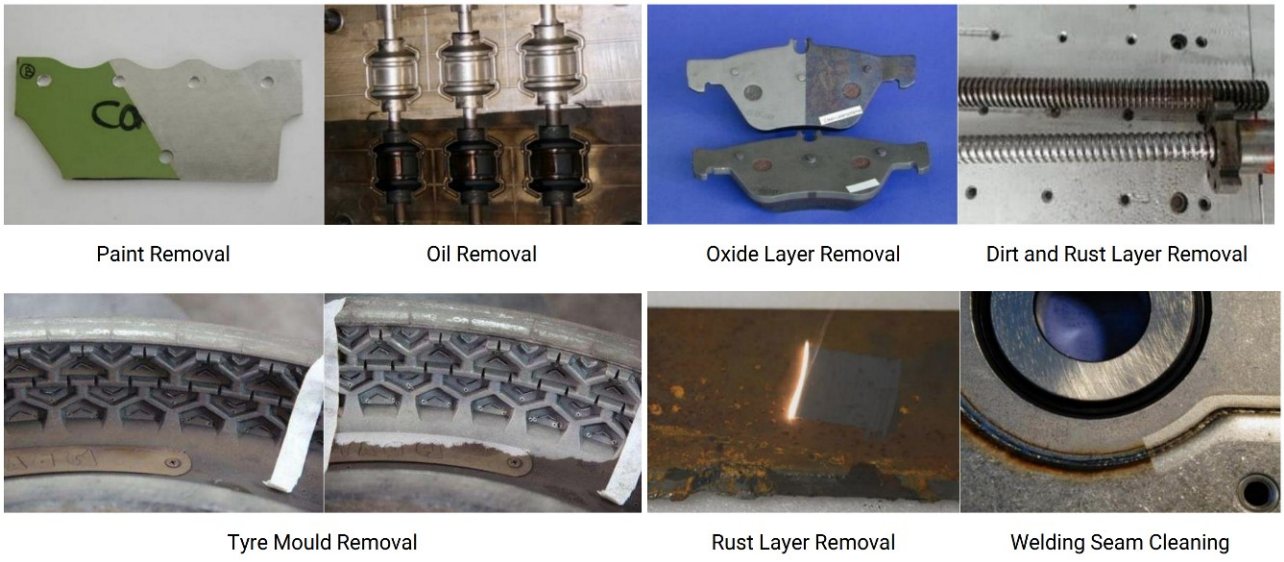
Features of Laser Cleaning

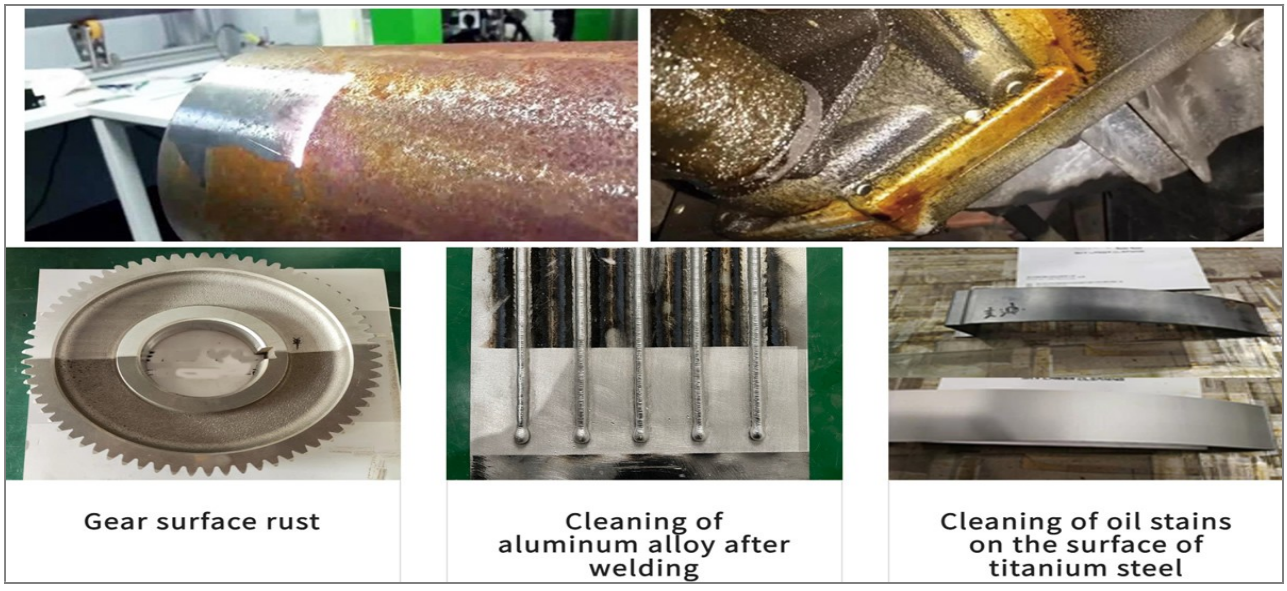
1. Non-contact cleaning, little damage to the base substrate layer.
2. Precise cleaning: Able to clean specific areas using pre-defined beam parameters.
3. Selective cleaning: Able to remove different types of materials individually, based on the ablation threshold.
4. High cleaning efficiency.
5. Stable and compact design, with minimal maintenance efforts.
6. Easy to operate: Can be used by operator or integrated with a robotic arm for automated cleaning.
7. No need to use chemicals, waters or other cleaning mediums. No consumables, safe and environmentally friendly.

Comparison of Various Cleaning Methods

	Laser Cleaning	**Chemical Cleaning**	**Mechanical Grinding**	**Dry Ice Cleaning**
Cleaning Method	Non-contact cleaning	Contact cleaning using chemicals	Abrasive contact cleaning	Non-contact cleaning
Damage to Base Material	Medium to Low	High to medium	High	Low to None
Cleaning Efficiency	High, selective cleaning possible	Low	Low	Medium
Cleaning Precision	High, controllable	Medium	Medium	Difficult to control
Consumables	Power, optics in cleaning head	Chemicals	Abrasive paper, sand, etc.	Dry ice
Environmental Impact	Low, no pollution	Chemical pollution	Dust pollution	Low, no pollution
Ownership and Operating Costs	High CapEx, low OpEx with few consumables and maintenance efforts.	Low CapEx, high OpEx with consumables.	Low CapEx, high OpEx with consumables.	Medium CapEx, high OpEx with expensive consumables.

Applications and Use Cases





1. Continuous Wave (CW) Laser Cleaning Machines with Handheld Cleaning Head

High-power CW laser cleaning machines are mainly used for impurity removal from metal surfaces, such as rust, paint and oil removal. The cleaning speed is very high, at the same time, there may be some damages to the substrate layer.

CW laser cleaning machines is a more economic option than pulsed laser cleaning machines. It is suitable for the refurbishment of marine vessel components, rail components, steel structures, and pre-treatment of metal components for welding, repainting, etc.

1.1 Air-cooled CW Laser Cleaning Machines





Part Number	**CL-CW-1200W-A** **CL-CW-1500W-A**
Laser Power	1200W, 1500W
Laser Wavelength	1080nm
Operating Mode	Continuous or modulated
Working Distance (Cleaning Head to Workpiece)	400mm
Scanning Width	5-150mm, adjustable
Fiber Cable Length (Machine Body to Cleaning Head)	10m
Fiber Cable Minimum Bending Radius	150mm
Cleaning Head Weight	1.8kg
Machine Weight	65kg
External Dimensions	520*715*744mm
Operating Temperature	15~35°C
Cooling Method	Air cooling
Clean Compressed Air Supply	0.4~0.6MPa, 100L/min
Power Supply	AC220V ± 10%, 50/60Hz, 32A
Power Cable Length	10m
Power Consumption (per hour, at 25°C)	≤ 8kW

1.2 Water-Cooled CW Laser Cleaning Machines





Part Number	CL-CW-1500W	CL-CW-2000W	CL-CW-3000W
Laser Power	1500W ± 2%	2000W ± 2%	3000W ± 2%
Laser Wavelength	1080nm	1080nm	1080nm
Laser Type	Fiber Laser	Fiber Laser	Fiber Laser
Operating Mode	Continuous or modulated	Continuous or modulated	Continuous or modulated
Beam Quality	M^2 < 1.2	M^2 < 1.5	M^2 < 1.5
Power Adjustment	10-100%	10-100%	10-100%
Cleaning Speed	≤ 30M^2 / hour	≤ 50M^2 / hour	≤ 80M^2 / hour
Working Distance (Cleaning Head to Workpiece)	400mm	400mm	400mm
Scanning Width	5-150mm, adjustable	5-150mm, adjustable	5-150mm, adjustable
Fiber Cable Length (Machine Body to Cleaning Head)	10m	10m	20m
Fiber Cable Minimum Bending Radius	200mm	200mm	200mm
Cleaning Head Weight	1.2kg	1.2kg	1.2kg
Machine Weight	160kg	170kg	190kg
External Dimensions	735*978*1185mm (height up to 1640mm including status light)	735*978*1185mm (height up to 1640mm including status light)	735*1178*1185mm (height up to 1640mm including status light)
Operating Temperature	15 ~ 35°C	15 ~ 35°C	15 ~ 35°C
Cooling Method	Water cooling	Water cooling	Water cooling
Clean Compressed Air Supply	0.4~0.6MPa, 100L/min	0.4~0.6MPa, 100L/min	0.4~0.6MPa, 100L/min
Power Supply	AC220V ± 10%, 50/60Hz, 32A	AC220V ± 10%, 50/60Hz, 32A	AC380V ± 10%, 50/60Hz, 32A
Power Cable Length	10m	10m	10m
Power Consumption (per hour, at 25°C)	≤ 8kW	≤ 10kW	≤ 12kW

Storage Temperature	-10 ~ 60°C	-10 ~ 60°C	-10 ~ 60°C
Optional Add-on	1. 20m fiber cable for 2000W machine 2. External I/O control		

2. Pulsed Laser Cleaning Machines with Handheld Cleaning Head

Pulsed laser cleaning machines have high peak energy and lower average power, as compared to CW laser cleaning machines. By selecting suitable laser parameters, it can be used to clean surfaces of non-metallic substrates such as ceramics, glass and composite materials.

It also can be used to remove surface impurities from metallic surfaces, though the overall efficiency will be lower than CW options due to its lower average power. Pulsed laser cleaning machines are generally more expensive.







Part Number	CL-P-200W	CL-P-300W	CL-P-500W
Laser Power	200W	300W	500W
Laser Wavelength	1080nm	1080nm	1080nm
Beam Quality	$M^2 < 1.5$	$M^2 < 1.5$	$M^2 < 12$
Working Distance (Cleaning Head to Workpiece)	254mm	254mm	254mm
Scanning Width	5-120mm, adjustable	5-120mm, adjustable	5-100mm, adjustable
Fiber Cable Length (Machine Body to Cleaning Head)	5m	5m	10m
Fiber Cable Minimum Bending Radius	150mm	150mm	150mm
Cleaning Head Weight	1.3kg	1.2kg	2kg
Machine Weight	24kg	37kg	160kg
External Dimensions	267*520*437mm	267*590*486mm	570*942*1125mm
Operating Temperature	15~35°C	15~35°C	15~35°C
Cooling Method	Air cooling	Air cooling	Water cooling
Clean Compressed Air Supply	0.4~0.6MPa, 100L/min	0.4~0.6MPa, 100L/min	0.4~0.6MPa, 100L/min
Power Supply	AC220V ± 10%, 50/60Hz, 16A	AC220V ± 10%, 50/60Hz, 16A	AC320V ± 10%, 50/60Hz, 16A
Power Consumption (per hour, at 25°C)	≤ 2kW	≤ 2kW	≤ 3kW

3. Components and Accessories

Machine

- Enclosed machine body with:
  - Laser source
  - Control card
  - Electrical system
  - Chiller (only for water-cooled versions)
  - Lockable roller castors
  - Detachable hoist rings
- Cleaning head with fiber cable, attached to machine body
- Touchscreen control panel
- Key switch
- Emergency stop button

Accessories and Consumables (included with every machine purchase):

- 1pc laser safety goggles, CE-certified
- 10pc protective windows
- Optics cleaning kit
- Alignment tool for red guiding light

Optional Consumables for Purchase:

- Protective window
- Focusing lens
- Collimating lens
- Reflective mirror

Consumables vary between models, please check with us for more details.