Vapormatt | Leopard Cub

Overview, technical specifications and options

Vapormatt

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Overview

The Vapormatt Leopard Cub wet blasting machine has been designed with the user and flexibility in mind. Each machine is designed to be tailored to the customer's specific needs to accommodate and reliably finish components to meet the stringent procedural demands in the aerospace industry. The Cub's capabilities excel with its ability to accurately and methodically clean, polish and peen hard-to-handle tall aerospace components. All of this is contained within the machine's small footprint.

The machine is able to automatically wet blast turbine engine and propeller blades that are clamped in place at the root via a hub connection. This clamping system can be designed and customised specifically to suit the end user's components.

Key features

- Fully automated, saving on processing time and labour
- Variety of configurations and able to suit a diverse range of applications
- Large working envelope to handle sizeable items
- Highly effective filtration system to ensure elevated levels of purity within the system
- Ultimately bespoke with a range of options to suit the needs of the end user and their processing requirements
- Complete controllability and repeatability
- No manual blasting, ensuring completely safe use by all personnel and reduce risk
- Customised clamping solutions designed to accommodate a wide variety of components in all shapes and sizes
- Full process monitoring and feedback of crucial process data and parameters

Industries and applications

Thanks to the robust and highly efficient build of the Leopard Cub and its incredibly consistent reproducible processing, it is well suited for providing a range of applications to aerospace components.

Industries

- Aerospace
- Composites

Applications

- Cleaning and crack detection
- Component cleaning
- Paint removal
- Creation of a reactive surface for coatings or bonding
- Titanium scale removal
- Shot peening

Processing description

The load height for the machine is approximately 1200mm (48") and is designed so the components can be loaded with a lifting device. The blast guns will be positioned and set up to ensure maximum coverage of the surfaces. The process begins with the operator loading the component onto the turntable. The operator can load parts without entering the machine thanks to the multiple options of loading mechanisms. After the operator closes the machine door, a recipe is selected on the Human-Machine Interface (HMI) which is automatically transferred to the Programmable Logic Controller (PLC).

The component holding turntable is servo controlled and during normal operation, this unit automatically processes components mounted on the turntable. The rotating table indexes to present the component to the gun blast stream. The nozzle traverses the components following the pre-programmed locus. During processing the machine monitors all parameters to ensure consistency: Slurry pressure, blast air pressure, airflow, abrasive concentration / abrasive to water ratio (optional).

After processing, a complete rinse cycle is carried out that thoroughly rinses the turntable and component to remove any remaining abrasive and return it to the sump. There will also be final blow-off cycle to remove excess water from the component's surface. The machine stops and the operator opens the door and unload the component from the turntable. Components can be manually rinsed and dried if required.

Oscillation unit

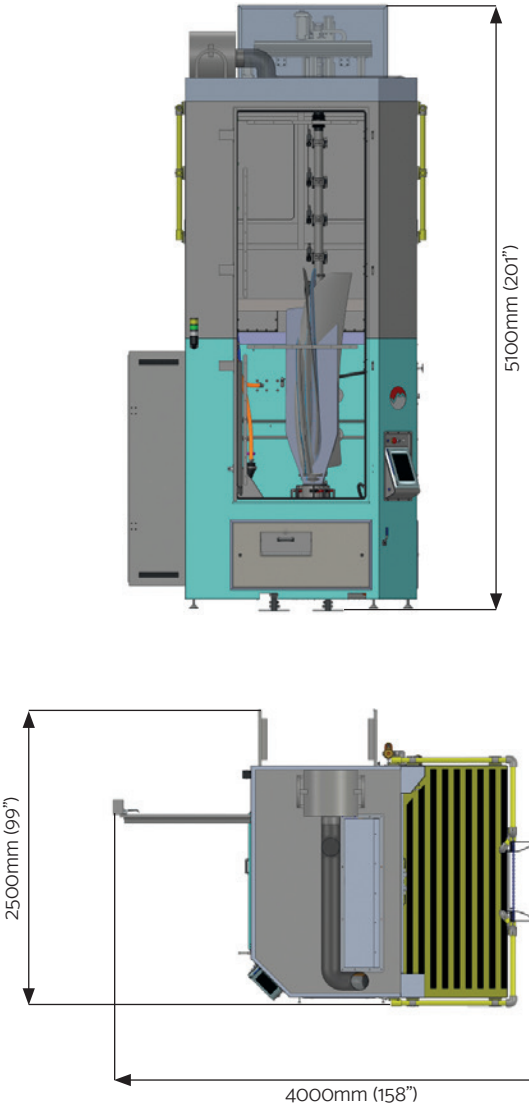
6-Axis Robot unit

Configurations

The Leopard cub machine is available in two different configurations:

Vertical and horizontal oscillation unit

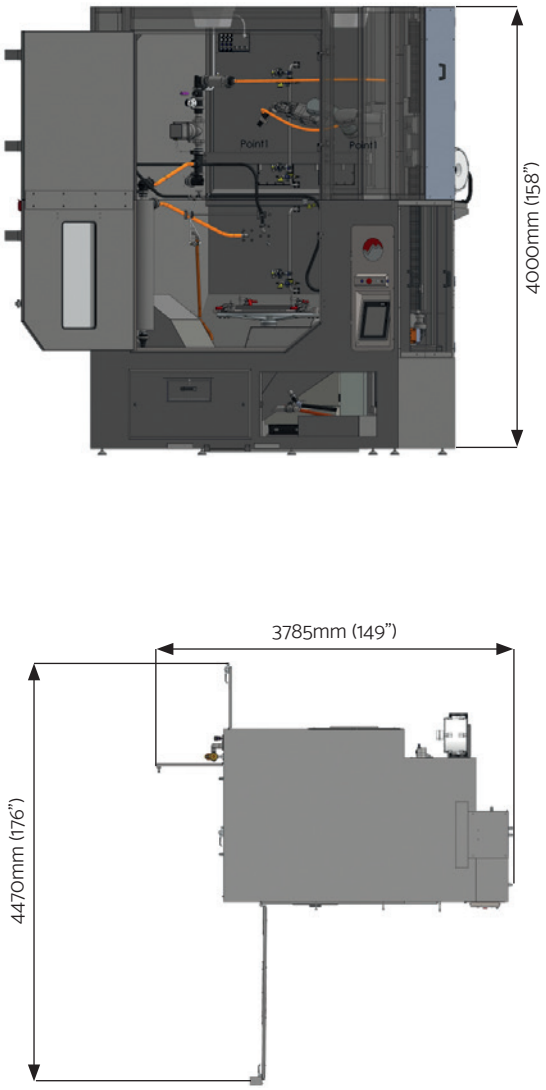
The image below gives an idea of a machine layout that could be approximately 2.5 x 4.0 x 5.1m (99 x 158 x 201"). The machine footprint is subject to change.



The machine is provided with a vertical and horizontal oscillation unit. The movement and manipulation of the axes in relation to the turntable are programmed via the HMI. The axes are powered by servo motors to increase the accuracy and speed of processing. The oscillation axes operate together to move the blast guns across the component in a pseudo-Raster scan.

6 Axis Robot unit

The image below gives an idea of a machine layout that could be approximately 3.8 x 4.5 x 4m (149 x 176 x 158"). The machine footprint is subject to change.



The machine is integrated with a 6-axis robot enabling full and complete manipulation of the process nozzle which allows program control and consistency.

Technical specification

The following features are included within the machine's basic specification.

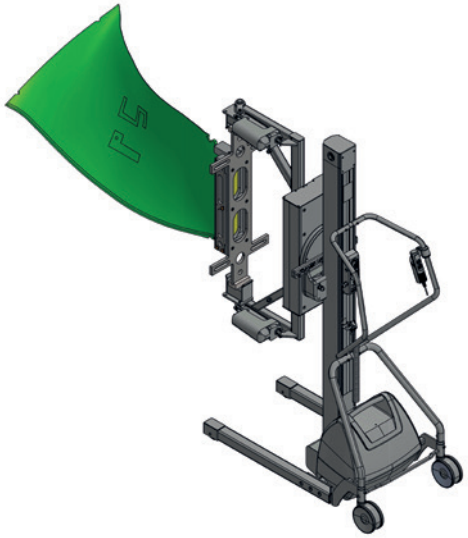
Feature	Description
1	**Blast cabinet** Constructed from welded stainless steel with abrasion-resistant lining. The main blast enclosure has a viewing window and comes with a wash bar and a manually operated wiper to allow observation of the equipment when in use.
2	**Sound attenuation** Maximum noise level of 75dBA.
3	**Component processing turntable** A stainless-steel automatic turntable 1 – 10 RPM is powered by a servo motor. A plastic turntable protection mat is provided. The turntable adjusts the components so that the area being processed is approximately normal to the blast stream.
4	**Abrasive slurry system** The slurry system incorporates 1 Vapormatt 50mm (2") 5.5 kW vortex pump fitted with slurry pressure monitoring and control system to facilitate recipe creation. The slurry is pumped through a series of abrasion resistant hoses and solid polyurethane components from the unique Vapormatt slurry pipework system.
5	**Blast Guns** Vapormatt MK3 blast guns made from solid abrasive resistant polyurethane and fitted with 10mm (0.4") boron carbide nozzles are mounted on an arm to allow good coverage of the turntable. Gun angles are manually adjustable. It should be noted that the permissible number of guns will be dictated by the type of component being processed and the twist of that component.
6	**Vapormatt VSPS Polyurethane Slurry Conduits** This system is unique to Vapormatt and consists of a range of elbows, tees, Y branches and flow splitters that connect with quick release stainless steel clamps. This eliminates the need for screwed pipe connections and steel pipework elements. Benefits include substantially longer component life, superior flow characteristics ensuring consistency of slurry, and ease of maintenance. It is Vapormatt's design policy to avoid threads within the process enclosure wherever possible due to the problems of thread galling because of contamination with process media.
7	**Abrasive slurry conditioning** This continuous abrasive filtration system facilitates accurate and controlled media size which is essential for long-term consistent blasting performance. Particles of broken-down abrasive and debris finer than the selected size are continually removed from the slurry circulation with a Hydrocyclone and collected in settling tanks at the rear of the machine. To compensate for lost abrasive due to breakdown, media level will need to be checked and added. The settling tanks are designed to allow their contents to be easily removed.
8	**Sight Glass** A media concentration sight glass will be provided. Operated by a manually controlled valve, this shows how much abrasive is in the machine.
9	**Component washing** Spray jets are positioned above the components and are supplied with water from a recirculated rinse system.
10	**Electrical control system (HMI)** The machine is provided with a sophisticated control system accessed via an HMI unit. All on-screen instructions will be in English. Units will be metrics. Electrical equipment is mounted in an IP65 enclosure.
11	**Preventative maintenance** The control system monitors usage of key components such as blast guns, hoses, valves and pumps. Reminders are set to warn when maintenance is due.
12	**Drain** Excess water is directed to a reservoir. When either reservoir is full a diaphragm pump pumps the waste to the customer's drain.
13	**Cabinet exhaust system** The machine needs to be connected to an in-house forced extraction system to maintain a slight negative pressure within the cabinet when operating.
14	**Cabinet Gridding** Gridding is provided above the sump area in the blast cabinet. This prevents large items accidentally entering the sump.
15	**LED lighting** A light unit is mounted in the blast cabinet.
16	**Manual rinse nozzle** Positioned at the load door to allow additional rinsing of parts and machine interior.
17	**Manual blow-off nozzle.** Positioned at the load door to allow parts to be dried.

Optional items

The following features can be added to the machine's basic specification.

Feature	Cabinet enhancement
1A	**Labels in non-English**
1B	**Translation of operation manual and HMI screen**
2	**Programmable ANDON status beacon** Allows the progress of production/process of the unattended machine to be monitored at a distance from the unit itself.
3	**Safety railing** This can be fitted around the roof if required by local safety regulations for servicing roof mounted equipment.

Feature	Loading and component handling
4	**Component fixtures and masking blocks** Polyurethane fixtures and masking blocks that can be used for components that do not require complete wet blasting.
5	**Component Loading** A Mini Lift with easy squeeze, complete with interchangeable arms.
6	**Turntable on swing arm** Allows table to be loaded outside of the machine and swung into position.
7	**Component trolley** For loading and unloading components
8	**Jib crane** A wall-mounted crane, on swing arm, 2m (3') arm length, with electric hoist, fixed on the reinforced cabinet structure, to load and unload parts; maximum load 450kg (992lb).



Feature	Slurry system enhancements
9	**Slurry concentration sensor** The SCS offers a continuous monitoring of the liquid abrasive concentration and has a closed loop control of the amount of abrasive media being circulated. The value of concentration will be displayed on the HMI unit. This parameter is changeable but will be set at factory to the user requirements. Watchdog guards are provided to inhibit machine start and prevent blast processing should slurry concentration levels drift outside of predetermined control limits.
10	**Automatic abrasive dosing system** The automatic media feed compensates for the broken-down media removed by the separation system. Avoiding the need for the operator to manually add abrasive on demand.
11	**Sump immersion heater** Is used to maintain a consistent sump water temperature. Elevated temperatures can allow chemicals to work more effectively and can promote faster drying of components.
12	**Automatic chemical dosing** Provided to maintain consistent chemical concentration within the blast process area; the chemical is fed directly from the storage barrel.

Feature	Filtration and Re-circulation
13	**Elutriation tower** This patented slurry conditioning system offers a more consistent blast slurry quality which allows for more reliable and repeatable processing. Particles of broken-down abrasive and debris finer than the selected size are continually removed from the slurry circulation.
14	**Exhaust extractor** Forced centrifugal extraction unit to maintain a negative pressure within the machine. Exhaust needs ducting to the external atmosphere.
15	**Exhaust extractor with mist eliminator** Forced extraction unit to maintain a negative pressure within the machine. The filter unit removes mist and dust and allows exhaust to workshop atmosphere. Will include an additive dosing system.
16	**Slurry removal system for quick change of abrasive** This secondary tank is connected to the machine and a "purge" valve can be selected to quickly pump the slurry within the machine through the buckets and tanks to quickly empty the system..
17	**DI water cleaning station** This option provides a filter and regeneration unit to purify the water supply to the required standard. The input water can either be from a mains water supply or water recirculated from the final rinse tank (this reduces overall water usage).
18	**Centrifugal separator** This system will separate the fines (that are not caught in the settling tanks) from the wastewater before sending it to drain and/or supplying clear rinse water.
19	**Wet and dry vacuum cleaner** A small size vacuum cleaner for daily routine cleaning and maintenance.

Feature	Process functionality
20	**A and C axes (For oscillation config only)** The blast gun gantry robot will have rotary vertical (wrist, A) and rotary horizontal axes (twist, C) axes, allowing the nozzles to continuously aim directly at the component.
21	**MK9 gun** These latest Vapormatt blast guns are approximately 10% more efficient than the Mk3 blast guns.
22	**Micro nozzles** For more efficient blasting of difficult to access areas, this low energy, precision nozzle can be mounted to the robot arm. Micro-nozzle consumption: 0.34Nm^3/min (12 SCFM) @ 4 bar.
23	**Manufacturing execution system (MES)** Allows for data logging of machine status during the wet blasting process.
24	**Barcode scanner** This enables the reading of data from any batch card for the automatic loading of recipes.
25	**Blast airflow monitoring system.** If flow drifts outside pre-set limits, at any given pressure, due to air jet or hose failure, a signal appears on the HMI unit.

Services to be provided by the customer

We always ensure our machines operate to the specification.

Service	Requirement
Electricity	400/480V 3 phase 50/60Hz, 46-amp supply with isolator.
Process air supply	Pressure 6 - 7 bar (90 - 100 psi) Max consumption 1.50Nm³/min (53 SCFM) Connection DN40 (1½ " BSP) Quality DIN ISO 8573-1: class 5.6.4. The pipework is marked light blue as per 92/58 EEC Isolation valve is provided.
Water supply	Pressure 2 – 7 bar (30 – 100 psi) Volume 13L/min (2.86 gpm) intermittent Connection; DN15 (½ " BSP) Drinking quality The pipework marked dark blue as per 92/58 EEC Isolation valve is provided.
Drain	Floor level with grit trap adjacent to machine. (Can be pumped to drain up to 5 - 10m (16 - 33') distant and 2 - 3m (6.5 - 10') high)
Vent or extraction	To be ducted to an in-house ventilation system or to outside atmosphere. Forced ventilation must be of sufficient capacity to maintain a negative pressure of 62Pa within the machine when all blast systems are operating at full capacity. Optional extraction unit can be supplied.
Foundations	Flat and level waterproof floor. Must be able to carry a point load of 500kg (1102lb).
Networking	Ethernet Internet connection is required. If via customer network, then it must be outside any firewall. To be available prior to commissioning.

Dedicated project management and the Vapormatt Promise

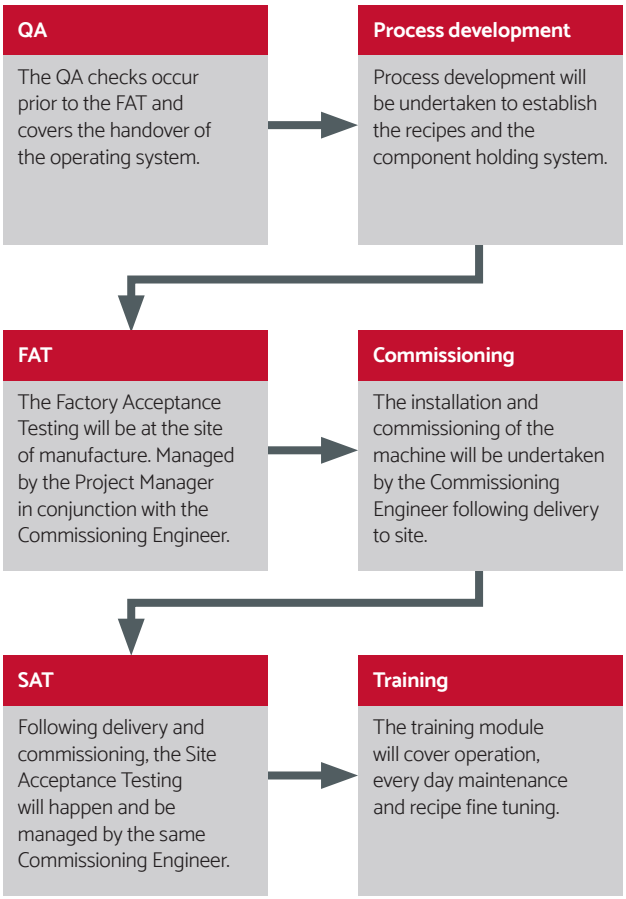
We always ensure our machines operate to the specification agreed upon with the customer, that's the Vapormatt Promise.

To achieve this every customer is assigned a dedicated project leader from order to installation.

Project management includes our detailed technical acceptance process, see below, a key part of which is our factory acceptance testing (FAT). This is where the customer's wet blasting system is extensively tested, often with the actual components the customer will be regularly processing before it leaves us.

Vapormatt support doesn't end there, our aftermarket support includes spares, servicing and Vapormatt 4.0, our Industry 4.0 solution, to ensure maximum production uptime.

Technical acceptance process



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