

SPB Series CNC Pipe Cutting & Beveling Machine

Introduction

SPCB CNC pipe cutting and beveling machining center is specially developed by our company by introducing French technology and combining the rich production experience of our company's technical experts in the field of pipe cutting equipment. It has been developed to the fourth generation of products. Mouth processing equipment has reached the world advanced level.

The basic processing principle is that the pipe is clamped without moving, the cutter head rotates at a high speed, and the machining tool feeds in layers according to the set feed amount to realize simultaneous cutting and beveling processing. At the same time, two sets of or Four sets of tool holders and knives meet various groove processing needs, simple and intelligent operation, mainly used for cutting and groove processing of stainless steel, carbon steel and alloy steel pipes. Self-centering double clamping on both sides of the pipe cutting position to achieve stable clamping of cutting + double-sided bevel processing.

All processing actions are completed through the PLC numerical control system combined with the man-machine control interface. The 10-inch man-machine interface is used to input the pipe processing parameters. After the program is set, the processing process is automatically completed, and one operator can operate multiple equipment alone.

All processing parameters of this CNC pipe cutting and beveling machine are digitally processed to realize the CNC automatic control of the processing process, and the preset, storage and call of all processing programs are completed by the human-machine interface. Cutting and beveling equipment.



Processing capacity

Processing material: carbon steel, alloy steel, stainless steel, low temperature steel, heat-resistant steel and other steels

The following processing forms are available:

1. Only bevel the pipe end face
2. Only perform straight pipe cutting processing



Cut off + beveling synchronous processing
Cut off + double-sided groove at one time

Processing steel pipe parameters

- Processing material: carbon steel, stainless steel, alloy steel, etc.
- Processing pipe diameter: see the following parameter table for details, according to the selected model specifications
- Processing wall thickness: ≤20mm (cut, groove, cut + double-sided groove)
- The length of the raw material pipe is less than or equal to 6m
- Length range of finished tube after blanking: ≥50mm
- Processing method: mechanical tool cold processing
- Roughness of grooved surface: ≤12.6μm
- Bevel shape: straight cut or V, U, Y, double V and other bevels, standard 30°V beveling Tool

Processing efficiency reference

Generally, the processing time for cutting and beveling a pipe with a wall thickness of 1mm at the same time is about 15s. The calculation method of cutting other thickness efficiency: 15 seconds × wall thickness, plus auxiliary time.

Note

The processing efficiency of the pipe is related to the wall thickness and material of the pipe, and other factors have less influence.

Equipment working environment

Ambient temperature	-20°C~+60°C, ISO12944-5 standard C-5 M environment
Relative humidity	≤85% at +25°C
Altitude	≤3000 meters
Earthquake resistance	Earthquake intensity 8 degrees
Operating time	8-24 hours' continuous operation, designed with machine tool lighting system to meet the needs of night work
Worksite	In the workshop or project site, low requirements for installation foundation
Power supply	380V ±10%, 50Hz

■ Technical performance advantages

Machining performance

Mechanical tool cold working, no heat input, no influence on the alloy elements of the pipe, the processing groove surface is metallic luster without repeated grinding, and can be processed carbon steel, alloy steel, stainless steel, low temperature steel, heat-resistant steel, etc. kind of steel.

High processing efficiency

Pipe cutting and two beveling processing can be completed in one processing, and only cutting processing or end face beveling processing can be performed. The comprehensive effect of the method is increased by more than 3 times.

High machining accuracy

Excellent machining accuracy, the verticality of the machine tool disc is less than 0.5mm, due to the influence of the ovality and curvature of the pipe itself, the verticality of the end face of the pipe groove after processing is less than 1mm, and the angle deviation is less than 0.5°; extremely It greatly improves the assembly efficiency and alignment accuracy of subsequent pipe workers, and provides reliable groove quality assurance for automatic argon arc bottoming of welds.

Good processing stability

The SPCB CNC cutting and beveling machine cutter head adopts 45# steel forgings with a thickness of 50mm for finishing and is assembled in one time. In the way of cutting stainless steel and alloy steel by band saw, after the saw blade is passivated or the equipment has been used for more than one year, there will be a large deviation in the verticality of the pipe after cutting (usually the deviation will be more than 2mm).

The pipe is clamped without deformation

The electric multi-jaw self-centering double clamping system is adopted, and a self-centering clamping system is arranged on each side of the pipe processing position. The circumference of the pipe is synchronously clamped and subjected to force, and it also has a certain rounding effect for thin-walled pipes, thereby further improving the beveling accuracy; The clamps of the beveling machine and the end face beveling machine are arranged on the left and right to realize the centering clamping method. When the thin-walled pipe is clamped, the pipe clamping deformation is easy to occur, which leads to the increase of the machining accuracy deviation of the beveling end face.

Advanced equipment and good operability

Fool-like operation, one operator can operate 2-3 sets of the CTA CNC cutting and beveling machine at the same time, the operator only needs to select the processing material and input the pipe processing parameters to start processing, after training 1-2 days can be skilled operation; In contrast, if the band sawing machine is used for cutting and the end face beveling machine is used for beveling processing, 2 operators are required to operate.

Low cost of use

In addition to saving people and improving efficiency, the CTA CNC cutting and beveling machine has no other consumables except the processing cutter head. The processing cutter head is between tens of yuan and 200 yuan, compared with a band saw blade. The cost of use can range from a few hundred to several thousand, which significantly reduces the cost of daily use.

The processing technology can be stored

It has the function of processing parameters storage, which can store the appropriate processing parameters in the system, and the processing program can be directly called when processing the same kind of pipe again, and 30 groups of processing programs for different pipes can be preset.

Adjustment of the center of different pipe diameters

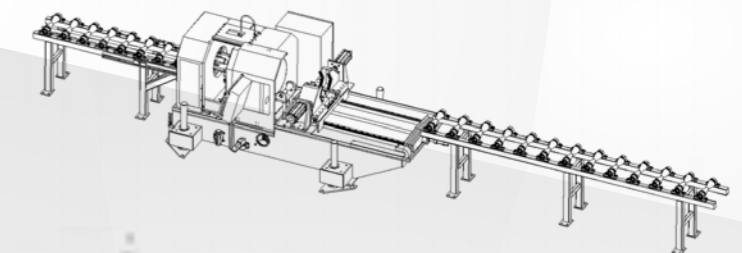
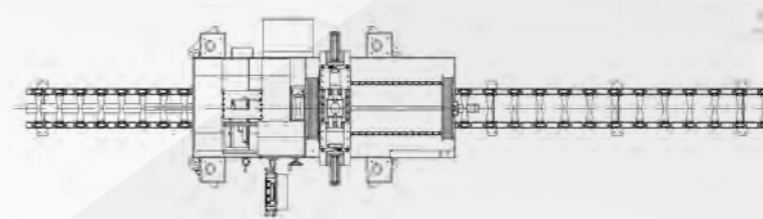
The beveling machine comes with an electric lift base, which consists of a screw lift + precision guide post + motor + reducer + encoder. By presetting the diameter of the pipe, the beveling machine can automatically adjust the center of the cutter head Height, to meet the height difference adjustment when processing pipes of different diameters.

Control software upgrade

After years of experience summarizing our company, for the characteristics of stainless steel pipe material that is soft and sticky, not easy to remove chips during processing, and easy to get stuck, our company has specially developed a special processing program software for stainless steel, using "Step-by-step feed" can effectively prevent the knife from being thrown, stuck, and broken, and greatly improves the processing performance of the equipment.




■ Project equipment configuration



Schematic diagram of the equipment layout of this project



Selection of equipment system configuration for this project

- CNC cutting and beveling machine host
- Heavy-duty electric lift base (four sets of lifts are linked together for automatic height adjustment)
- CNC fixed-length conveying system
- Secondary clamping moving mechanism (optional, not required, see the following instructions)
- Circulating water cooling system
- Mitsubishi PLC control system and man-machine operating system
- Operation box and electrical control cabinet
- Input roller table + output roller table

Configuration	Function
SPCB CNC pipe cutting and beveling machine	<p>Including rigid machine base, machine tool gearbox, spindle cutter head rotation system, machining tool post, self-centering main clamping system, mobile self-centering pair clamping system, servo automatic tool advance and retract system, main engine heavy-duty electric lifting system (Through the automatic lifting of the processing host, the processing concentricity of the host and the tube can be adjusted), etc.</p> 
Heavy Duty Electric Lift Stand	<p>The whole mechanism is composed of lead screw elevator + precision guide post + motor + reducer + encoder, which is linked up and down by 4 groups of elevators, which can adapt to the processing range of the host; the elevator is driven by a motor reducer; the operator controls the lifting system through the console, after inputting the command, the lifting platform will automatically align the center of the machine with the pipe on the conveying platform, and the minimum unit of height is accurate to millimeters.</p> 
Electric main/sub multi-jaw self-centering clamping system (with 2 sets of quick loading and unloading clamps)	<p>Each host is equipped with two sets of fixtures, which are applicable to different models: SPCB-6: One set is suitable for DN20~DN50, and the other set is suitable for DN50~150; SPCB-12: One set is suitable for DN40~DN150, and the other set is suitable for DN200~300; SPCB-16: One set is suitable for DN50~DN250, and the other set is suitable for DN250~400; SPCB-24: One set is suitable for DN300~DN450, and the other set is suitable for DN450~600;</p> <p>Among them, the clamps with large pipe diameters are pre-installed on the telescopic jaws of the main machine, and do not need to be disassembled. The clamps with small pipe diameters can be quickly disassembled and assembled. The pull-out type is adopted to realize quick assembly and disassembly, and the quick-plug design is adopted, and each replacement time does not exceed 5 minutes.</p>
Tool holder and tool 2 sets	<p>The advance and retraction of the tool holder is precisely controlled by servo motors, and the forward, non-moving and backward movements of the tool during the machining process are realized through the plane helical toothed disk drive, which has extremely high tool-travel accuracy and use stability;</p> <p>Equipped with a set of cutting tool holders, a set of beveling tool holders, equipped with a water cooling system, the processing tools can be cold-cut during processing to provide service life;</p> 

Configuration	Function
CNC fixed-length conveying system	<p>It is installed at the pipe entry end of the cutting and beveling machine, and is integrated with the base of the main machine. It is integrated in the PLC linkage control of the main machine. When the pipe section is fixed-length processing, after the processing length is input through the CNC cutting and beveling machine operation interface, the fixed-length conveying system automatically clamps Hold and drive the pipe to be continuously fed into the beveling host. At this time, the length of the processed pipe is the set length. When the host is clamped and processed, the fixed-length conveying mechanism returns to the origin and waits for the next pipe to be transported; the fixed-length pipe feeding speed $\leq 6000\text{mm/min}$, fixed length accuracy $\pm 1\text{mm}$.</p> 
Production line PLC total control system and operating system	<p>It meets the requirements of CE certification and is the core of the entire equipment system. The operation control adopts a 10-inch man-machine interface to input working parameters.</p> <ol style="list-style-type: none"> 1. You can edit and input multiple sets of pre-processed pipe parameters at one time, without setting one for processing; 2. It has the function of processing parameters storage, which can store the appropriate processing parameters in the system, and can directly call the processing program when processing the same kind of pipe again, and truly realize the one-button fool operation mode. 3. It has the function of fault alarm for each function of the production line. When a function fails to work abnormally, it has a prompt function in the man-machine interface, which is convenient for quick maintenance and diagnosis; 4. There is an emergency stop button. Press the emergency stop button to cut off the power supply in an emergency, and each function will stop working. At the same time, the automatic processing program has a power-off memory recovery function. When restarting, you can choose to continue processing or restart processing; 5. Whether automatic or manual, the sequence of key actions before and after each application unit is interlocked to prevent disoperation; 6. The key components such as PLC and modules, man-machine interface, and servo motors are all made of Japan's Mitsubishi brand; switch buttons, circuit breakers and relays are made of Schneider; induction switches are made of Omron; pneumatic components are made of AirTAC. 

Machine's performance parameters

The detailed model specifications and parameters are shown in the following table:

Specs	Model	SPCB-6	SPCB-12	SPCB-16	SPCB-24
Pipe Diameter		Φ34-168mm (DN30-150)	Φ50-325mm (DN40-300)	Φ60-426mm (DN50-400)	Φ325-630mm (DN300-600)
Clamping Jaw		Primary/Secondary Double Clamping 3-claw self-centering	Primary/Secondary Double Clamping 4-claw self-centering	Primary/Secondary Double Clamping 4-claw self-centering	Primary/Secondary Double Clamping 6-claw self-centering
Clamping Way	The electric multi-claw self-centering and concentric clamping of the pipe, the circumference of the pipe is evenly stressed, the thin-walled steel pipe is clamped without deformation, and it also has a certain rounding effect on the thin-walled steel pipe with large ovality.				
Material	Carbon steel, alloy steel, stainless steel, low temperature steel, heat resistant steel, etc.				
Processing Thickness	Carbon steel 3-30mm (stainless steel, alloy steel 3-20mm)				
Beveling Way	V/Y//U/Double V type (standard 0° cutting knife and 30° V beveling knife)				
Processing Accuracy	The verticality of the bevel end face≤1mm; the smoothness≤Ra12.5, the angle deviation≤0.5°				
Clamping Motor	750W				
Clamping Speed	240mm/min				
Lifting System	The beveling machine comes with an electric lift seat to realize the up and down height adjustment of the processing head				
Lifter number	It consists of screw lift + precision guide post + motor + reducer + encoder, etc.				
Lifting Travel	According to the diameter of the processing pipe, the main machine can be automatically lifted to the appropriate height				
Lifting Speed	4 groups, synchronous lift				
Lifting Motor	≤250mm				
Cutter Feed	≤310mm/min				
Cutting Speed	1500W				
Cutting Speed without load	Servo control automatic tool feed, automatic tool retraction to the origin after machining				
Coolant Way	Carbon steel≤10mm/min, stainless steel, alloy steel≤5mm/min				

Controller	Feed amount 0.1-0.2mm/rpm	
Controller Panel	≤80mm/min	
Operate Way	Circulating water cooling or air cooling	
Feeder servo motor	Japan's Mitsubishi PLC CNC program automatic control	
Difficulty of operation	Japan's Mitsubishi 10-inch HMI	
Process storage, recall	After presenting the processing parameters, the processing can be started with one key	
Height adjustment of different pipe diameter difference	Japan's Mitsubishi 750W absolute value servo motor	
CNC fixed-length conveying system	Structure and composition	Servo motor + planetary reducer + high-precision ball screw drive + linear guide
	Driving power	Japan's Mitsubishi 750W absolute value servo motor
	Fixed length clamping	Cylinder-driven left and right centering clamping of pipes
	fixed-length walking speed	≤6m/min
	Fixed length conveying accuracy	±1mm
	Fixed length machining accuracy	≤0.5mm (Theoretically, the processing length can be achieved without deviation after the batch tube fixed-length processing is set by the compensation value)
	Fixed length machining compensation	Fixed length accuracy compensation, knife width kerf compensation
Tube center adjustment	The electric lifting adjustment center, after inputting the pipe diameter, the beveling machine is lifted to the appropriate height	
Input power	380V±10% 50HZ	

■ Electrical control system

The system control adopts a control system with Japan's Mitsubishi series PLC programmable controller and servo motor as the core. It is mainly composed of a control box, an operation box and other parts. The operation box is completed by a 10-inch Japan Mitsubishi man-machine interface to complete the processing procedures of the equipment. The whole system has advanced technology, safe and reliable work. The electrical components selected for this equipment are products of international famous brands such as Schneider and Omron.

Safety precautions:

The design of the equipment fully complies with HSE and other safety and health standards.

- Safety cover: The equipment has an equipment safety cover. When the equipment is processing, the protection cover can seal the rotating cutter head to protect the safety of the operator and the operating environment.
- Safety limit mechanism: designed with safety limit and emergency stop switch to avoid safety risks when equipment is misoperation.
- The running parts of the equipment must be equipped with safety protection, anti-collision protection devices and limit switches.
- People-oriented design concept, using closed machine tool protective cover and safety door to effectively isolate iron chips and chip liquid splashing, etc. During processing, when the safety door is opened, the equipment processing is interrupted, and when it is closed, it can start to continue processing, and it has equipment failure alarms A series of safety measures such as prompts, parameter setting error prompts, etc.

Main component configuration table

No.	Items	Specification	Brand
1	PLC and modules	\	Mitsubishi
2	relay, sensor switch	\	Schneider or Omron
3	touch screen	10inch	Mitsubishi
4	servo motor	\	Mitsubishi
5	Linear Guides	\	TBI
6	switch button	\	Schneider
7	Pneumatic Components	\	AirTAC