Laser Processing Equipment Procurement Risk Avoidance Guide by Dowell Laser

Foreword

In today's booming laser industry, selecting the right laser equipment is crucial for factory operations. This manual is meticulously crafted for laser factory owners, equipment managers, and purchasing personnel. It encompasses nearly 10 years of practical experience in laser equipment selection, involving a deep analysis of key aspects of the entire process, from power selection and core component identification to contract signing, after-sales support, and the procurement of used equipment. Abandoning obscure theory, it presents a straightforward, easy-to-understand, and directly applicable practical guide to help you effectively avoid selection Procurement Risks that could cost hundreds of thousands of dollars, safeguarding the steady development of your business. The following sections outline proven steps to help you make informed choices and avoid costly mistakes.

I. Essential Steps Before Selection: Define Your Needs First, Then Look at the Equipment; 90% of Procurement Risks Stem from Mismatched Needs.

First, clarify the core processing scenario and reject pseudo-needs, such as a "one-step solution."

1. **Thin Plate Precision Laser Cutting/Welding (within 3mm): In this scenario, a 1000W-2000W fiber laser is the ideal choice.** This power range is sufficient to meet the precision and efficiency requirements of thin plate processing. Blindly pursuing high power not only leads to wasted costs but may also increase unnecessary operational complexity due to overkill equipment performance.
2. **Medium-thick plate processing (5-12mm):** For processing plates within this thickness range, lasers with a power range of 3000W-6000W are more suitable. Priority should be given to models capable of continuous full-load operation to ensure stable and reliable operation during long-term, high-intensity processing tasks, guaranteeing production efficiency and quality.
3. **Ultra-thick plate processing (15mm and above):** When processing ultra-thick plates, high-power models of 8000W or higher are essential. At this stage, beam quality and overall machine stability become key considerations. Excellent beam quality ensures the precision and quality of cutting or welding, while stable overall machine performance is a strong guarantee for continuous and efficient production.

To proceed effectively, it's important to remember that you should calculate the total lifecycle cost, not just the bare machine price.

This mindset will inform the evaluation steps that follow in your selection process. In the process of purchasing laser equipment, many purchasing personnel often only focus on the bare machine price, neglecting the long-term costs of consumables, maintenance, and after-sales service. Some low-priced OEM machines may seem attractive in terms of initial purchase cost, but subsequent maintenance costs may far exceed the price of the equipment itself. Therefore, during the selection phase, it is essential to inquire with the supplier in advance about the commonality and unit price of vulnerable parts such as protective lenses, nozzles, and gun heads, and to estimate the annual consumable cost budget accordingly. Only in this way can the true cost of the equipment be comprehensively assessed throughout its entire lifecycle, avoiding falling into a long-term cost trap due to short-term gains.

II. 10 Fatal Selection Procurement Guide (90% of Factories Have Fallen For)

Procurement Risk 1: Focusing Only on Peak Power, Ignoring Rated Continuous Output Power

Many vendors often attract customers with peak power when advertising equipment; however, in actual applications, rated continuous output power is the key. Some equipment is labeled as 3000W, but the actual rated continuous power is only 2500W. During short-term trials, this difference may not be noticeable, but when the equipment operates at full load for extended periods, the power decay rate will accelerate dramatically, halving the equipment's lifespan.

Avoidance Guidelines:

- Clearly specify the rated continuous output power, not peak power, in the contract. Set a minimum full-power limit, such as greater than 1500W (some unscrupulous manufacturers increase the output current to meet customer power requirements, causing the equipment to operate beyond its rated capacity, which damages the equipment's long-term lifespan; power typically decays rapidly after about six months. It's best to clearly specify relevant laser current, voltage, and other parameters to protect your rights.
- Request a power testing report from the manufacturer and conduct on-site testing using a power meter. Run the equipment at full load for 30 minutes; the power deviation should not exceed ±5% (some companies allow 2%, or power fluctuation data after 48 hours of long-term aging, or power decay data after 500 hours—these are all required by laser industry standards). If this range is exceeded, the equipment should be rejected.

Procurement Risks 2: Blindly Trusting Imported Brands or Choosing Unbranded/OEM Laser devices for Cheaper Prices

As the core component of laser equipment, the quality of the laser directly determines the performance and stability of the equipment. Some purchasing

personnel either blindly trust international brands, believing that foreign products are always superior to Chinese ones, or they choose unbranded/OEM lasers for the sake of lower prices. In fact, unbranded, OEM, or small-factory assembled lasers have a failure rate exceeding 50%, and often face difficulties in obtaining spare parts and after-sales service.

Avoidance Guidelines:

- Prioritize lasers from top-tier brands. For international imports, consider IPG, SPI, and Trumpf; for Chinese brands, Raycus and Max are recommended. These brands have been tested by the market for a long time, and their product quality and after-sales service are reliable.
- Clearly specify the brand, model, and even production date of the laser in the contract (laser manufacturers currently iterate their versions quickly, so avoid selling older versions as new). After the equipment arrives, verify each item to prevent merchants from passing off refurbished or low-spec machines as new or substandard products.

Procurement Risk 3: Neglecting the Cooling System Directly Affects Laser Lifespan

The cooling system is crucial for the stable operation and lifespan of a laser. Different power lasers have different requirements for cooling systems; improper selection will severely impact equipment performance.

Avoidance Guide:

- For lasers below 1000W, air cooling is usually sufficient; for lasers between 1000W and 3000W, an industrial water chiller is necessary to ensure efficient heat dissipation; for high-power lasers above 3000W, a dual-cycle cooling system with constant temperature, filtration, and water level alarm functions should be used to ensure stable operation under complex conditions.
- Never use ordinary civilian chillers as substitutes for industrial chillers. Laser processing environments contain a lot of dust, and civilian chillers have limited filtration capabilities, making them ineffective in handling this dust. This can easily lead to condensation in the laser cavity, power attenuation, and even laser burnout, causing significant losses to the company. (For water chillers, the main considerations are water flow rate, cooling power, head, and water pressure. These must meet the laser's requirements. The chiller temperature must also be set according to the ambient temperature; it cannot be set to simply low or normal temperature. The dew point temperature must be considered to prevent internal damage to the laser head and laser unit due to condensation. Currently, leading manufacturers often compromise on the sealing performance of laser heads and laser units due to cost considerations, unless the original laser manufacturer specifically advertises or designs this feature.)

Procurement Risk 4: Focusing solely on equipment parameters without on-site testing.

Selecting laser equipment based solely on parameters often leads to discrepancies with actual processing needs. Equipment parameters only reflect theoretical performance, while actual processing results are affected by numerous factors.

Avoidance Guide:

- Bring the thickest, most demanding, and most complex sheet material used in daily processing to the manufacturer for on-site testing. Have the equipment continuously cut or weld for 30 minutes, focusing on key indicators such as whether the cross-section is perpendicular, whether there is slag buildup at the bottom, whether the weld is uniform, and whether there are any pores or cracks.
- Run the equipment idle for 10 minutes, carefully listening for any abnormal sounds and observing its operational stability. Take the prototype back to the workshop for trial assembly and welding to confirm compatibility with subsequent processes before considering further cooperation with the manufacturer, ensuring the equipment fully meets production requirements. (Generally, equipment manufacturers have their own internal set of cutting parameters, but these are designed for most normal needs and may not meet all customer requirements. During communication, it's best to clarify whether the manufacturer provides equipment adjustment services.)

Procurement Risk 5: After-sales service only states "lifetime maintenance," without specifying response time and responsibility.

"Lifetime maintenance" seems like an attractive after-sales promise, but if the response time and responsibility are not clearly defined, the company may suffer huge losses when equipment malfunctions. Many vendors promise "lifetime after-sales service" but do not specify the on-site arrival time, resulting in maintenance personnel arriving 3-5 days after equipment failure, causing factory downtime losses that the company bears entirely.

Avoidance Guide:

- The contract must clearly specify the after-sales response time, stipulating an 8-hour on-site response within the province and a 24-hour response time outside the province. For malfunctions that cannot be resolved within 48 hours, the manufacturer must provide a backup machine or bear the corresponding downtime losses.
- Simultaneously, clearly define the scope of free replacement parts within the warranty period to avoid disputes over parts replacement and ensure the timeliness and effectiveness of after-sales service.

Procurement Risk 6: Ignoring Equipment Compatibility and Upgrade Potential

As enterprises develop and production needs change, equipment compatibility and upgrade potential become particularly important. Ignoring this during selection may lead to equipment incompatibility with existing systems or inability to meet future upgrade requirements, thereby increasing management costs or premature equipment obsolescence.

Avoidance Guide:

- When selecting a model, confirm whether the equipment's operating system supports common CAD/CAM file formats and whether it can interface with the factory's existing MES system to ensure smooth data flow and avoid additional management costs due to data incompatibility.
- Confirm the equipment's power upgrade potential. For example, when selecting a 3000W model, confirm whether the output head, laser head, cooling system, software operating system, and even key components such as machine tools and motors can be upgraded to 6000W. This way, future performance improvements can be achieved simply by replacing the laser module, avoiding the need for complete machine obsolescence due to a lack of upgrade potential and maximizing the utilization of equipment investment. (This can be disregarded if there is no upgrade requirement, and it is not recommended to upgrade existing machines due to non-standard features, reliability, and compatibility issues.)

Procurement Risk 7: Neglecting Safety and Environmental Compliance

Safety and environmental compliance of laser equipment are crucial aspects that cannot be ignored. If equipment does not meet relevant standards, it may not only cause safety accidents but also fail environmental inspections, forcing companies to halt operations for rectification.

Avoidance Guide:

- The equipment must comply with EN60825 - 1 Laser Safety Class 1 certification, with an overall protection rating of IP54 or higher, and be equipped with laser safety interlocks, emergency stop buttons, and a dust removal system to comprehensively ensure operator safety.
- Confirm that the dust removal system meets local environmental requirements, has four-stage filtration and dust removal capabilities, and ensures that dust emissions during production meet environmental standards, avoiding unnecessary trouble for the company due to environmental issues. (During equipment use, operators should wear laser protection equipment, goggles, protective clothing, and safety shoes.)

Procurement Risk 8: Purchase contract lacks acceptance standards, making it difficult to protect rights after delivery.

If the purchase contract does not clearly specify acceptance standards, the company will face difficulties in protecting its rights when quality problems arise after the equipment arrives. The merchant may use various excuses to shirk responsibility, refusing to accept returns or exchanges or bear corresponding losses.

Avoidance Guide:

- The contract must clearly specify acceptance standards in detail, covering key indicators such as power deviation, cutting/welding accuracy, operating speed, failure rate, and the lifespan of vulnerable parts. At the same time, the contract should clearly specify return and exchange clauses for

non-compliance, ensuring that if the equipment does not meet standards after delivery, the merchant must bear corresponding responsibility, protecting the company's legal rights.

Procurement Risk 9: Neglecting operator training leads to poor equipment utilization.

Even if high-end, advanced laser equipment is purchased, if operators are not professionally trained, they cannot fully utilize the equipment's performance, resulting in wasted resources.

Avoidance Guide:

- The contract should clearly specify the training content, training duration, and number of trainees provided free of charge by the manufacturer. Training content should include equipment operation, parameter debugging, daily maintenance, and basic troubleshooting to ensure operators are proficient in all equipment functions, can operate independently, and maximize equipment efficiency.

Procurement Risk 10: Blindly Purchasing Used Lasers – Falling into Refurbished and Faulty Procurement Risks

The used laser market is rife with substandard products. Blindly purchasing can easily lead to refurbished and faulty lasers, posing significant risks to businesses. Some disassembled or refurbished lasers of unknown origin not only have unreliable performance but also present difficulties in after-sales maintenance.

Avoidance Guide:

- When purchasing used lasers, prioritize top-tier brands with a service life of no more than 3 years. Original manufacturer maintenance records must be available to ensure reliable provenance and a clear usage history.
- Before purchasing, conduct on-site power and beam quality measurements, carefully inspect the cavity for condensation, and check for repair records on the modules. Furthermore, confirm whether the original manufacturer provides after-sales support, as many used laser manufacturers do not offer maintenance services. In case of malfunction, the equipment may be rendered unusable; therefore, this is crucial.

III. Daily Laser Maintenance Standard Checklist (Extends 3-Year Service Life, Ready for Use)

Maintenance Cycle	Core Maintenance Content	Execution Standard
Daily	● Check protective lenses for stains and damage. ● Check chiller water level, temperature, and quality. ● Clean dust and debris from equipment surfaces. ● Before starting, check the lubrication of guide rails and transmission components.	Water temperature controlled at 20℃ ~25℃, water conductivity ≤5μS/cm, lenses free of stains and scratches.
Weekly	● Clean the dust removal system filter and air duct. ● Check all fasteners for looseness. ● Calibrate the coaxiality of laser equipment cutting/welding heads. ● Check circuits and gas lines for leaks and damage.	Gas line pressure stable, no leaks, circuits without aging or exposed parts, coaxiality deviation ≤0.05mm.
Monthly	● Replace circulating cooling water and clean the chiller filter. ● Add special lubricating oil to the guide rails, rack, and bearings. ● Conduct a comprehensive test of the laser output power and record the power attenuation. ● Check if the safety interlock and emergency stop functions are normal.	Power attenuation should not exceed 5% of the initial value, all safety functions should trigger normally, and lubrication should be in place without jamming.
Annually	● The original manufacturer will issue a maintenance and inspection report, restoring all equipment parameters to factory standards. ● Replace aging seals and cables. ● Perform a full calibration of the equipment's accuracy. ● Upgrade the equipment firmware to the latest stable version.	The original manufacturer will issue a maintenance and inspection report, restoring all equipment parameters to factory standards.

IV. Quick Troubleshooting Guide for 80% of Common Laser Faults (No need to wait for after-sales service, you can solve it yourself).

Fault 1: Severe Laser Power Attenuation

1. Check the laser head protective lens: Check the surface of the protective lens for stains, scratches, or damage. If present, clean or replace it promptly.
2. Check the chiller: Confirm that the chiller's water temperature is within the normal range of 20℃~25℃, and that the water conductivity is ≤5μS/cm. If not, adjust the water temperature or replace the cooling water.
3. Check the optical path: Check for optical path misalignment and coaxiality deviation of the cutting/welding head. If deviation is found, perform appropriate calibration and adjustment.
4. Inspect the laser module: Check the laser output head for burnt spots and red light. Use professional equipment to test the laser module's output power to determine if power attenuation is due to module aging. If the module is aged, contact the manufacturer for repair or replacement.

Fault 2: Laser backlight alarm

1. Check the cutting/welding head nozzle: Immediately stop the machine and check if the nozzle is clogged. If clogged, clean or replace the nozzle promptly.
2. Check the protective lens: Check if the protective lens is damaged. If damaged, replace it immediately.
3. Check the optical path: Check if the optical path is aligned and if any abnormal reflected light enters the cavity. If there is a problem with the optical path, readjust it.
4. Adjust processing parameters: Appropriately reduce the processing power, adjust the defocusing amount, and confirm whether the reflectivity of the board material is too high. If the reflectivity of the board material is too high, appropriate surface treatment measures or adjustments to the processing technology can be taken.

Fault 3: Equipment does not emit light

1. Check the emergency stop button: Confirm whether the emergency stop button has been reset. If not, reset it.
2. Check the equipment door interlocking: Check if the equipment door interlock is closed to ensure the equipment is in normal working condition.
3. Check the laser power supply: Check if the laser power supply is normal, including whether the power connection is secure and the voltage is stable.
4. Check the chiller: Confirm if the chiller is operating normally and if there are any alarm prompts. If the chiller is faulty, troubleshoot it promptly.
5. Check the control software signal: Check if the control software signals are transmitted normally. Troubleshooting can be done by restarting the software or checking the communication line.

Fault 4: Poor Weld/Cut Surface Quality

1. Processing Parameters Check: Confirm that parameters such as power, speed, and defocusing amount match the current processing task and adjust them according to the actual situation.
2. Protective Lens Check: Check the protective lens surface for stains. If stains are found, clean or replace the lens.
3. Nozzle and Air Pressure Check: Check if the nozzle is damaged and if the air pressure is stable. If the nozzle is damaged, replace it; if the air pressure is unstable, adjust it to a suitable value.
4. Inspect the sheet metal: Check the surface of the sheet metal for oil stains and oxide layers, and ensure the tooling is securely positioned. Clean the sheet metal or re-fix the tooling to ensure processing quality.

V. Three Core Clauses Required in the Laser Equipment Purchase Contract

Warranty Clause:
The warranty period for the core components of this equipment (laser, chiller, motion control system) is no less than 3 years, and the warranty period for the entire machine is no less than 1 year. During the warranty period, the manufacturer will provide free on-site replacement and repair for non-human-caused damage to parts, without charging any fees.

After-Sales Response Clause:
In case of equipment failure, the manufacturer must provide a remote solution within 1 hour. If the problem cannot be resolved remotely, on-site service will be provided within 8 hours within the province and within 24 hours outside the province. If the problem cannot be repaired within 48 hours, the manufacturer must provide a backup machine of the same specifications or bear the client's downtime loss of XXX dollars per day.

Acceptance Clause:
After the equipment arrives, the client will conduct an on-site acceptance inspection according to the acceptance standards in the appendix to this contract. If the inspection fails, the client has the right to request the manufacturer to rectify the problem within 7 days. If the product still fails to meet the standards after rectification, Party A has the right to return the goods unconditionally, and the manufacturer shall refund the full amount already paid and bear all losses incurred by Party A as a result.