YOFC Gain Amplifier Block

1. Background

Optical fibre laser is a kind of solid-state laser which uses rare earth element doped silica fibre as gain medium. It is mainly composed of pumping source, pump combiner, resonant cavity, active optical fibre, and isolator.

Compared with traditional solid-state lasers and CO_2 lasers, optical fibre lasers have three advantages. Firstly, the light beam has good quality and high energy density, and is suitable for high-speed precision machining. Secondly, the operating cost is low, and the electro-optical conversion efficiency is up to 30%, which is incomparable to other existing solid-state lasers and gas lasers. At the same time, since optical fibre, the medium with high specific surface area, is adopted, the heat dissipation effect is good and the cooling system is simple and easy to maintain. The third advantage is flexible transmission. Since optical fibre laser is compact in structure and small in volume, when laser energy is transmitted through optical fibre, the constraint on the distance to the machining object will be small and the integration with automatic equipment such as robot arm can be realized to achieve flexible machining.

Yangtze Optical Fibre and Cable Joint Stock Limited Company (hereinafter referred to as "YOFC") has provided specialty optical fibre services for many years in the optical fibre laser industry in China. The specialty optical fibres based on optical fibre lasers have been manufactured in large quantities and put on the market, such as multi-mode pigtails for pumping source, signal optical fibres for pump combiner, double-cladding Yb-doped optical fibres, and signal energy optical fibres for isolator and collimator. In addition, high-power optical fibre grating will be launched soon.

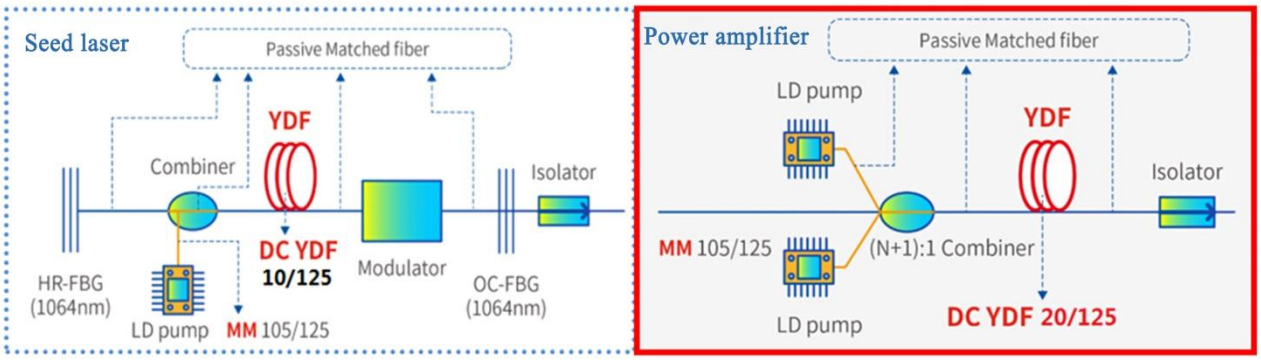

Figure 1 Integrated Solution for Optical Fibre Laser

At present, the optical fibre laser mainly adopts modular design, which is more conducive to structural design and assembly manufacturing. In this case, the later maintenance will be simple and efficient. At the same time, after modularization, a single laser can also be used as an energy module for the parallel integration with higher power lasers, and the operation reliability will be higher. Based on the reasons above, layered electrics and optics design and assembly are adopted, and the most important amplifier module in the optical fibre layer is designed into two parts according to

different power and functions: seed laser block and gain amplifier block (hereinafter referred to as "Gain Block").

2. Introduction to YDFA Gain Block of YOFC

Depending on its technological accumulation in design, manufacturing and application of optical fibres, at the same time of providing solutions of specialty optical fibres used by optical fibre lasers, YOFC has launched the YDFA Gain Block to meet the requirements of optical fibre laser manufacturers in performance improvement, cost control and production standardization. The block uses YOFC's multimode pump fibre, high-performance double-cladding Yb-doped fibre and high-precision matched passive fibre. YOFC provides modular solutions for laser manufacturers through stable supply of materials and whole-machine performance control.

Among them, the 10/125 and 20/125 double-cladding Yb-doped fibres used in medium and low power fibre laser (pulse) for marking are the achievements of years of research & development and technical accumulation of YOFC. No photon darkening, higher cladding absorption coefficient, higher conversion efficiency, and long-term reliability has been achieved by Double-cladding Yb-doped fibre. In addition, with the responsive technical support, YOFC has become the mainstream fibre supplier in the domestic optical fibre laser market.

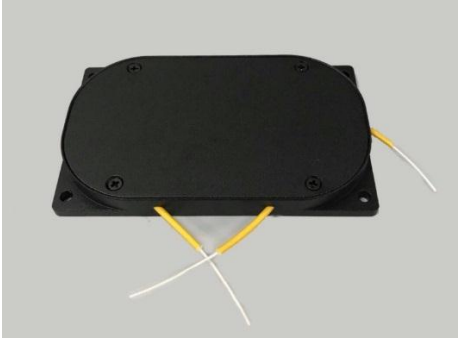

Figure 2 YDFA Gain Block of YOFC

At present, YOFC has launched mainly the 20W marking optical fibre laser gain amplifier block for MOPA and Q switch, with indicators as shown in Table 1. In addition to providing Gain Block, YOFC will also provide technical services such as optimized optical fibre splicing.

Table 1 Optical Parameters of YDFA Gain Block of YOFC

Optical Parameter	Gain block 20-100	Remarks
Typical Output Power (W)	20	(Depend on pump power)
Operations Wavelength (nm)	1030-1100	
Optical Efficiency (915nm pump)	65±5%	
Pulse Broadening (ns)	30±5	
Optical Beam Quality Factor M2	<1.5	
Pump Absorption (dB)	16±0.5	(or customized)
Signal Input Fibre	DC GDF 10/125, 6/125	(or customized)
Pump Fibre	MM105/125	
Number of Pump Ports	2	(or customized)
Gain Fibre	DC YDF 20/125	(or customized)
Operation Temperature (℃)	35±5	

On this basis, YOFC provides a complete range of specialty optical fibre and key device solutions for medium and low power fibre lasers. As a leading manufacturer of specialty optical fibre in China, YOFC

will continue to develop key technologies of special optical fibres and devices, and contribute to the vigorous development of optical fibre laser industry.

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