

Advances in Industrial High-Power Excimer Lasers Technology

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The paper presents a review of the most recent achievements as well as a discussion on the main directions in the development of the industrial high power excimer lasers. The results of the development of a XeCl lasers with the output energy above 900 mJ and the pulse repetition frequency up to 600 Hz will be described. The system performance such as energy stability as well as the life time issues necessary for the extended maintenance cycles and finally low cost of operation in industrial applications will be discussed.

Over the last decade, excimer lasers have transitioned from scientific instruments into industrial-grade workhorses capable of supporting 24/7 manufacturing.

Excimer lasers excited by the electrical discharge are the most powerful ultraviolet laser sources now. Despite advances in semiconductor and solid state lasers, the excimer still remains unchallenged as the only laser able to deliver high pulse energies and high average power at ultraviolet wavelengths.

The further increase of laser output power together with a boost in reliability is an important trend in the industrial excimer laser development. Lowest operating costs are mandatory for a success in the highly cost conscious mass applications. Gas and cavity windows life time as well as durability of the main laser components are key parameter to achieve this goal.

The recent results of the development in high power excimer laser technology driven by industrial requirements will be discussed. Special emphasize will be on the design of the pre-ionization, a critical component enabling homogeneous generation of a sufficient large number of charge carriers in the discharge area as well as on the influence of different electrode materials on the laser performance. The performance of an industrial high power (up to 500 W) XeCl system with excellent energy stability (< 0.5% RMS) will be presented (see Fig. 1).

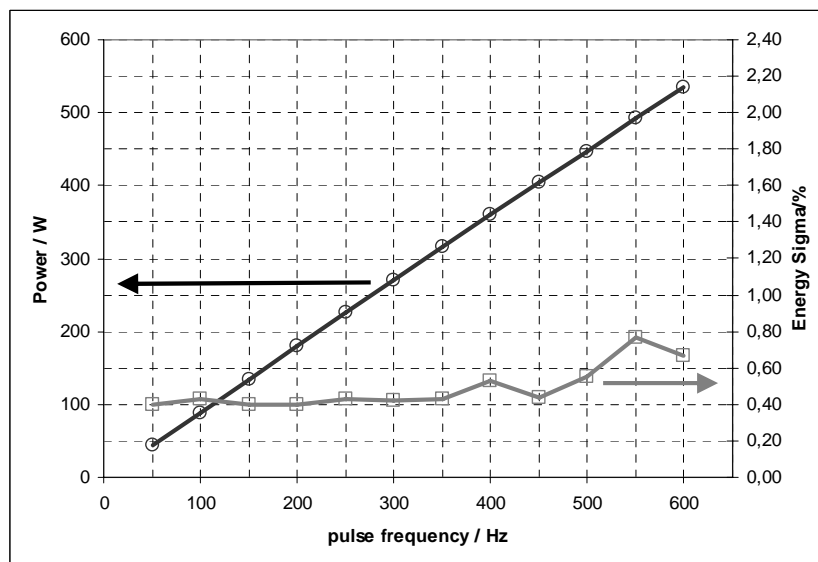


Fig. 1. Power and energy stability of the 600Hz XeCl laser

LTPS annealing and micromachining are only two examples for the broad range of successful applications. An overview over the fields of applications and the specific requirements will be given.

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