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Sommario	<p>Every day in the world 64'125 GWh of electricity are produced and consumed: to satisfy this huge demand, many different power sources are employed, and in the last years the renewable energies share has kept on increasing. However, coal is still the main energy source and, thanks to the huge growth of China energy production, the amount of electrical energy produced this way is increasing: every day 12.1 million tons of coal are burned to fulfill 40% of the global electrical energy demand. In Italy, even if only 16.7% of the total power generation is obtained with coal combustion, coal is still the third power source, after natural gas and hydroelectric, and we have to import it in the amount of 17.5 million tons every year. Coal has an extremely variable composition, and heat power, pollutants generation and, consequently, cost, strongly depends on that composition; for these reasons whoever deals in coal is always on the look for instruments that allow to perform faster and more accurate analysis of coal composition. Devices able to perform on-line quantitative analysis of coal chemical composition are already commercially available; however, they are extremely expensive and must undergo strict regulations, due to the fact they employ either x-rays, gamma rays or neutrons. On the other hand, laser induced breakdown spectroscopy, or LIBS, has proven itself as a cost</p>

effective solution and has found many applications in other fields. In my Ph.D. thesis I have developed a working prototype for on-line quantitative analysis of coal based on LIBS, following every step of its realization. The main task has been the design and realization of an innovative collection optic that allows to perform measures on raw coal, at a distance of 1 meter from a conveyor belt; the innovative part consists in the fact that it doesn't resort to the use of moving parts, decreasing its cost and increasing its reliability. My tasks also included the development of the software for data collection and analysis, the test of the instrument and its calibration. I have been deeply involved also into the choice of the components and the design of an instrument for the test in a real power plant.

Localizzazioni e accesso

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