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"Training Course on Laser Applications in Industries"

sponsored by

United Nations Industrial Development Programme
International Centre for Science and High Technology
ICS/UNIDO

Final Report

By

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Synopsis

A Training course on Industrial Laser Applications in Industry was held in Fortaleza at the Federação das Indústrias do Estado do Ceará (Industry Federation of the State of Ceará) in the Northeast region of Brazil from 5 to 9 of October 1998. This course had 25 participants being 7 of them out of state. Lecturers invited from other parts of the country and also from other countries presented the state of the art of laser technology applied to industrial processes such as cutting, marking, drilling and soldering that are the most important processes where lasers can be applied with economy, efficiency and being environment friendly. Laboratory demonstrations, video presentations and visits were provided to the participants, illustrating very well, the course and helping the assimilation of new concepts. Awareness and capacity building in the participants, could be detected since these newest technologies have a great appeal to the industrialists and even for the people of the Local University, both eager to learn about these new technologies concepts and their applications.

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ICS/UNIDO Training Course
LASER APPLICATIONS IN INDUSTRIES
Fortaleza, Ceará from 5 to 9 of October 1997

Scientific Final Report

1. Introduction

Most of the countries in the Latin American region are developing economies. However, although developed in some high-tech niches, they lack the appropriate University-Industry interaction. Sometimes, for a same country, there are different degrees of regional development with drastic contrasts among their regions. The industrial development of Brazil processed apart to the investment in higher education. Brazil has a good critical mass of scientists but that is concentrated in the South. Other regions of the country also lacked the speed of economical growth that the South reached. Now this situation is being reverted. In particular, the Northeast region of Brazil, if regarded as a country by itself when compared with other Latin American countries, ranks 4th by its GNP with an annual economical growth rate that is twice of Brazil. This region is mostly semi arid where it is usually difficult to develop agriculture. This region is, today, mostly devoted to a development of an industrial park that will be able to promote its sustainability.

Of particular interest for this region is the industrial use of lasers since this tool may provide new ways of making old things or also manufacturing new things that were impossible to do before the development of lasers. In this region there is an urgent need for lasers as a high technology tool in solving efficiently present and future problems. Thus, this new age entrepreneurs, with the help of lasers, will now aggregate technology to his product or service. Therefore, the opportunity created by a training course aimed to this particular sector of the economy is vital to start up a culture of technology transfer and thus help the economical development of the region. For that reason, a partnership between the Physics Department of the University of Ceara and the State Federation of Industries was established. The course took place in the headquarters of the Federation of Industries of the State of Ceará where, businesspeople and industrialists had the opportunity to get in contact with this technology and with the lecturers and representatives of laser industries.

2. Objectives

The philosophy behind this training course was to provide the industrialist-technologist from the Northeast region of Brazil with some training on advanced areas of laser applications in their business and industries. It was also an opportunity to put them in contact with one another and with their colleagues from different states, in order to promote exchange of experiences and technical information. Moreover, this course was an opportunity to strengthen the links among ICS/UNIDO, scientific institutions, all scale industries and business organisations in the region with the final objective of creating a network of high level scientific institutions, small scale industries organisations and technicians from industries.

3. Location of the Training Course and Choice of the Institution

Ceará is the epicenter of a modernisation trend in the Northeast region of Brazil that is utilising new technological basis to be competitive in a globalised economy. This region has 1.550.000 square kilometers and a population of 43,4 million inhabitants. This region is divided into 9 states being Ceará one of the largest. Fortaleza, its capital, is the 5th largest city of Brazil with 2,400,000 habitants. Ceará is implementing a large infrastructure of ports and siderurgy industry. The yearly investments in the physical structure of this state are around US\$ 3 billion. The energy consumption of Ceará doubles at every 3 years. Ceará is now attracting technology-based industries in the sectors of leather, textiles, fine chemistry, plastics, metal mechanic and siderurgy to produce plane and laminated steels.

The course was held under the scientific responsibility of the Physics Department of the Federal University of Ceará and under the administrative responsibility of FCPC, Fundação Cearense de Pesquisa e Cultura. The host organisation, the Federation of Industries of the State of Ceará, provided overall facilities for the Training Course including coffee breaks. The FCPC administrated the Training Course budget that included UNIDO funds plus the counterpart funds raised by the event.

4- Partnerships and Joint Ventures that Provided Additional Support to the Training Course

Considering that the Training Course on Industrial Applications of Lasers was specifically oriented towards technology transfer and industrial applications, other interested bodies were also involved. The most important contribution came from SEBRAE/CE Serviço de Apoio às Micro e Pequenas Empresas, the Brazilian Organisation for the Support of Micro and Small Industries that contributed with additional funds (US\$3,200.00). This financial support was of a major help since it provided funds to promote the course through advertisements such as folders and posters, (annex - course material). The State Secretary of Science and Technology contributed funds to pay the organisational personnel like secretaries and clerks (with approximately US\$3,000,00). Folders and posters announcing the course were widely distributed throughout of the Northeast region informing about dates, programme, lecturers and local of the event (**annex 1**)

5. Programmatic Structure of the Course

Due to the fact that the course was mostly directed to the local industrialist and that this kind of public does not have the full day to participate in an intensive training like the proposed one, the course was divided into two main interrelated segments. In one segment a sensitisation of the audience was made with videos and demonstration of optical basic mostly to answer such basic questions like WHAT ARE LASERS? WHY AND WHEN TO APPLY LASERS? Deeper laser concepts were introduced after the presentation of the introductory lectures, demonstrations and videos including lecturers



from representative of industries. Specific lectures, dedicated to specific industry people, were reinforced at the end of the working day, when this kind of audience has more time availability. The course had a total of 25 participants (**annex 2**) being 7 of them from out of state (interregional) organisations.

The programme developed (**annex 3**) followed a logical sequence where basic principles of lasers and of fundamental of optics were given. The 8 lecturers (5 from Brazil, two from Argentina, one from Italy) that participated in the course were originated from various institutions (**annex 4**). More than 10 hours of illustrative videotapes were given by the lecturers and by invited companies representatives (**annex 5**). Case studies were always opportunely presented and economical issues like cost benefit analysis were approached. Redundancy of some programme items was on purpose to help the assimilation of concepts since the public did not have physics or laser background. More than 10.000 photocopies of course material (copies of transparencies, texts and referred biography) were distributed to the participants (**annex 6**).

A Scientific visit to the University laboratories and facilities were provided, where demonstrations of laser development and laser utilisation were made. A visit to a local industry "Sangati Berga" that carries a Bistrionic Laser cutting machine, was provided and highly appreciated by the participants. Since 35% of the industrial laser application market refers to cutting of materials, special emphasis was given to this application. However, a good part of the course was devoted to the description and discussion of the latest technologies implicated in the uses of lasers in industry like cutting, drilling, welding and marking. Lectures on safety and laser classification were also conducted.

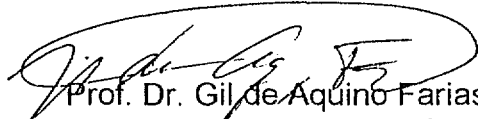
6 - Conclusions and recommendations

The reaction of the audience was very satisfactory and their participation very active. This gave a good indication that the course, although introducing a high technology concepts for the first time in this region, encountered a resonance within the local business people that somehow devised ways of introducing this technology in their products and processes. The presence of the Secretary of State of Science of Technology of the State of Ceará during the opening ceremony and his words to the audience clearly indicates the eagerness of the local and regional industrialist to incorporate high technologies. The support to this ICS UNIDO initiative was unanimous.

7 - Annexes

1. Model of correspondence sent to regional organisations with Posters and Folders
2. List of participants and their organisations with application forms
3. Programme of the course
4. List of Lecturers and their affiliations
5. List of Companies present or visited during the event and reference material distributed
6. Material from lecturers distributed during the course





Prof. Dr. Gil de Aquino Farias
Physics Department, University of Ceará - Local Organiser

FUNDAÇÃO CEARENSE DE PESQUISA E CULTURA

Financial Statement (1)

Value credited by UNIDO US\$20,000.00


Amount expended US\$ 20126.00

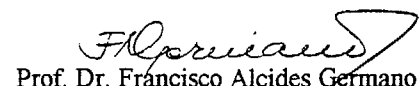
Balance (US\$ + 436.00)

Item discrimination	Provision	Expended	Balance
Participants (2)			
9 interregional participants x 6 days x \$70.00 (board and lodging)	3,600.00	2,973.00	+627.00
9 interregional participants x 6 days x 15\$ (pocket money)	1,440.00	630.00	+810.00
Travel costs			
Air tickets for 7 participants x \$ 1,000.00 (average)	3,600.00	-----	+3600.00
Terminals for 7 participants 7 x \$35,00	480.00	-----	+480.00
Lecturers (3)			
8 lecturers x 5 days x 15\$ (pocket money)	700.00	600.00	+100.00
Average board and lodging for 8 lecturers	4,200.00	4,500.00	-300.00
Fees			
(6 lecturers x 2 working days + 2 lecturers x 1 working day) x 150\$ per working day	2,100.00	2,100.00	0
Travel costs			
Air tickets for 8 lecturers x \$ 900.00 (average)	6,300.00	6,417.00	-117.00
Terminals for 8 lecturers x 35\$	280.00	280.00	0
TRANSPORTATION	1,500.00	1,500.00	0
PHOTOCOPIES AND PRINTED MATERIAL	1,000.00	1,000.00	0
TOTALS	25,200.00	20000.00	+5200.00

Observations or justifications

1. This Statement did not consider Administration and Overhead according to ICS instructions
2. Tickets were not provided to 8 interregional participants since they came with their own tickets
3. Due to programme necessity, the number of lecturers had to be increased to 8


 Prof. Dr. Gil de Aquino Farias
 Local Organizer


 Prof. Dr. Francisco Alcides Germano
 Executive Secretary of FCPC