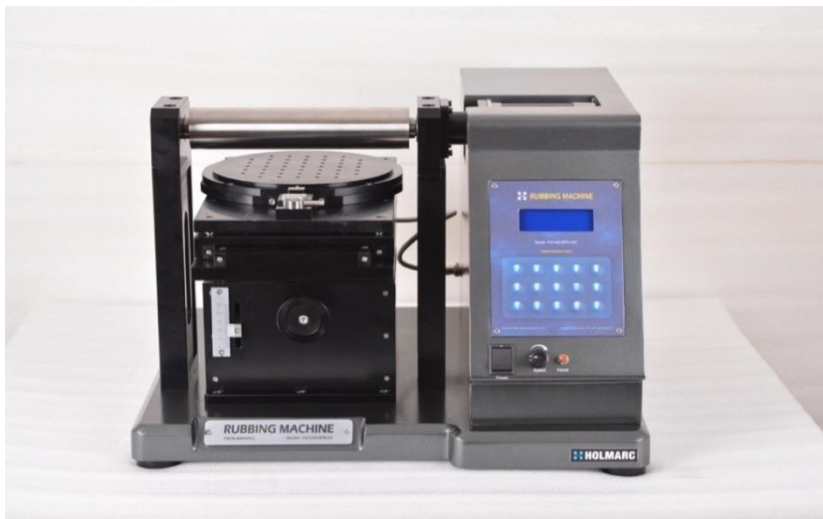


Low-cost, indigenous rubbing machine developed for manufacturing LCDs

As we view the television today, the warbled picture on a 1950s TV set seems almost a distant dream. The impressive Liquid Crystal displays (LCD) technology has been a ubiquitous part of our everyday lives for decades. Liquid Crystal Displays (LCDs) are used in all electronic devices such as in televisions, laptops, computers, cell phones and so on.

Rubbing is one of the most crucial processes required for LCD fabrication. The proper anchoring of liquid crystal, a component required for visual image production, is achieved via rubbing. Internationally, the display manufacturing industries have large rubbing machines for in-house consumption and R&D purposes. But even in the present day of globalization, researchers in India rely on manual rubbing process with not-so-well-reproducible results.



In view of its importance, a group of researchers from the University of Hyderabad have developed and designed a low-cost, indigenous rubbing machine—employed for the manufacturing of LCDs. Having the potential of creating new market forces across the globe, the machine is first of its kind in India and the cheapest in the world.

Liquid crystal display (LCD) screens are manufactured by assembling two transparent electrically conducting glass substrates in which the liquid crystal is confined. Aligning the sandwiched liquid crystal in a twisted fashion is very crucial for LCDs fabrication. The steps involved in creating the alignment layer include deposition of a thin layer of polymer, thermal treatment and a controlled uni-directional mechanical rubbing using soft velvet. Rubbing process creates microgrooves, where the liquid crystals get in, and so, a required alignment of liquid crystals is achieved over the entire LCD. Thus a uniform rubbing of substrate is very crucial for LCDs.

Dr Surajit Dhara, Professor, University of Hyderabad has been working actively in the field of liquid crystals for several years. The rubbing machine designed by Dr Dhara is simple to operate, portable, and inexpensive. A rotating spindle, stringed by a special velvet rubbing cloth is positioned above a vertically movable stage. The stage is put on a track so that it can move forward and backwards in the horizontal direction with specified speed. The glass plate is held by a vacuum chuck for which a vacuum pump has been included and integrated with the system. The glass plate along with vacuum chuck is held on a rotation stage so that it can be rotated and positioned at any required angle. Well defined microgrooves are created on the polymer coated glass plate as it moves along the stage on the track. The

rubbing pressure is adjusted by changing the gap between the spindle and the glass plates at different vertical planes.

For various rubbing orientations, the entire process is repeated two or three times under similar conditions. While assembling the LCD panel, two plates are arranged in such a way that the microgrooves are orientated perpendicular to each other giving a twisted structure to the inserted liquid crystal.

Though LCDs are not manufactured in India yet the advent of this technology in advance is a step ahead in future. Transferred to Holmarc Opto-Mechatronics Pvt. Ltd. India, the machine is commercially sold in India and abroad. Currently, the technology is being used for R&D purposes—for making prototypes and in studying fundamental aspects of liquid crystals & LC based vehicles. It is expected that the machine will not only encourage LCDs fabrication in India but will also significantly lower the production cost.