

Expert in Membrane Technology for Water Treatment

- **Turn-key Transfer of Proprietary Technology of Manufacturing Membranes for Water Treatment and Desalination**
- **Membrane and Process Development**
- **Engineering Consulting**
- **Contract Research**
- **Six Sigma Quality Management System**



INTRODUCTION

The provision of clean drinking water from raw or salty water, the treatment and recycling of waste water, and the efficient recycling of streams and intermediates in manufacturing processes are among the most pressing challenges facing society today. Membrane technology offers one of the most important and rapidly growing responses to these challenges, with an astonishing rate of growth. Today more than 60 percent of the world's seawater desalination plants and 80% of ultrapure water treatment plants use the thin film composite reverse osmosis membrane (TFC-RO) as the core technology of the water treatment plants.

About NLCT and Its Founder

NLCT Specialties

NL Chemical Technology, located in Mount Prospect, IL, was founded by Dr. Norman N. Li in 1995. It is now a leading water treatment membrane technology company with a proven track record of providing its customers with state-of-the-art water treatment solutions by using advanced RO and NF membranes.



NLCT has:

- A broad portfolio of water treatment membrane technologies to address the most demanding applications
- Unique business model which allows for technology licensing and turn-key operation
- Membrane technology that has been validated in commercial scale high volume manufacturing
- Advanced membranes for high growth and attractive water treatment and desalination markets

- World renowned scientists and experienced management and development teams
- Long track record of continuous advancement in membrane technology
- Quality of excellence using advanced Six Sigma techniques in management and production

NLCT Leadership



Dr. Norman Li is an internationally renowned scientist who has more than 40 years' experience in American chemical and petroleum industries. He was a senior scientist with Exxon Research and Engineering Co. and the director of research at UOP Co. and Honeywell. He also served as a consultant for the U.S. Apollo Moon Landing Project. He has the honor of being members of three academies, the US National Academy of Engineering, the Chinese Academy of Sciences, and the Academia Sinica in Taiwan. Dr. Li has 45 US patents and more than 100 technical papers, and has edited 20 books, all in the field of separation science and technology.

Dr. Li is the recipient of numerous awards and honors for his innovation and leadership in membranes and separation technologies. He was given the highest honor in the US chemical industry, the Perkin Medal. His other awards include the Lifetime Achievement Award from the World Congress of Chemical Engineering held in Melbourne, Australia, 2001, and the Founders Award from the American Institute of Chemical Engineers, the highest honor given by the Institute. In 2011, he received the Alan S. Michaels Award from the North American Membrane Society, which is the highest honor given by the Society. Dr. Li served as the president of the Society (1991 - 1993), a board director of American Institute of Chemical Engineers and the Director of American Chemical Society's Industrial and Engineering Chemistry Division. He also served as the Chair of the International Congress of Membranes and Membrane Processes held in Chicago, 1990 (ICOM 90).

NLCT's Technology for Water Treatment

NLCT Expertise

Since 1995, NLCT's engineers and chemists have developed proprietary technologies of manufacturing all the major types of membranes for water treatment and desalination of sea water.

NLCT is also proud of our proprietary advanced multifunctional machine design, process technology, and automation along with process innovation and integrated quality system that will enable the customer to produce a highly consistent membrane product at lower cost.

NLCT's strong technical team collaborates with world class membrane production equipment manufacturers to provide exceptional technologies and services.

- Strong technical team consists of experts in research, engineering, manufacturing processes, quality management, and equipment design and fabrication.
- Alliances with specialized membrane production machine builders
- Advisory committee consists of world renowned scientists

NLCT's Membrane Product Portfolio

NLCT's newest generation of membranes (3rd generation) represents more than 20 years of focused research and development and has resulted in a portfolio of RO and NF membranes that covers major applications and meets or exceeds industry standards.

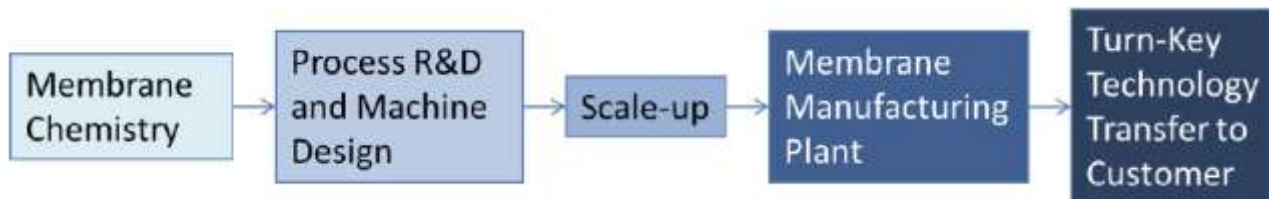
Below is a chart summarizing the applications of the TFC membrane products using NLCT's proprietary technologies. More details can be found in NLCT's website, and membrane specifications are available upon request.

NLCT proprietary TFC membrane type	SW	Seawater membrane				NF-1	
	BW	Brackish water membrane				High rejection nanofiltration	
	ULP	Ultra-low pressure membrane				NF-2	
	XLP	Extra-low pressure membrane				High flux nanofiltration membrane	
	FR	Fouling resistant membrane					
Applications	SW	BW	ULP	XLP	FR	NF-1	NF-2
Seawater desalination	√						
Marine	√						
Brackish water treatment		√	√	√	√		
Water softening						√	√
Drinking water process		√	√	√	√	√	√
Waste water reclamation		√			√	√	
Municipal water treatment	√	√			√	√	√
Industrial/process water		√	√	√	√		
Semiconductor rinse water		√	√	√	√		
Pesticide/organics removal						√	√
Water for pharmaceutical		√	√	√			
Antibiotics production						√	√
Food/wine/beverage		√				√	√

Technology Transfer and Customer Service

NLCT's business model is to transfer cutting edge membrane technologies to the marketplace. It saves customers considerable time and cost to develop their own technologies, while allowing them to access NLCT's excellent customer service and to update their production process based on NLCT's latest advancement of manufacturing technology.

NLCT's technology development can be divided into 5 steps:



NLCT conducts applied research in membrane chemistry and process development with the goal to develop new generations of membranes to meet the requirements of different separation applications. It has pilot facilities for continuous membrane casting and coating experiments. The pilot units are for studying not only the continuous manufacturing process, but also equipment design and process scale-up for commercial production. NLCT's mature and reliable proprietary membrane technologies and strong technical support team guarantee successful completion of membrane manufacturing plants. Upon start-up of the manufacturing, NLCT continues to provide training and technical support to ensure that the full capacity of the plant is met. We believe that technology and service are equally important for a successful turn-key technology transfer.



NLCT designed equipment in a membrane manufacturing plant



NLCT's membrane technology successfully used in chemical plants, food processing industry and water reclamation systems

Licensing NLCT's Membrane Technologies for Commercial Production

RO Membrane

- Seawater membrane (SW)
- Brackish water membrane (BW)
- Ultra low pressure membrane (ULP)
- Extreme low pressure membrane (XLP)
- Fouling resistant membrane (FR)

NF membrane

- High rejection NF membrane (NF-1)
- High flux NF membrane (NF-2)

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