



# Case Study

## NYE LUBRICANTS SUCCESS STORIES

Dulub Co., Ltd. [www.dulub.com.tw](http://www.dulub.com.tw) tel : 886-7-536 5500



### BionX™ (iWalk)

Industry: Medical

Application: Ankle Prosthesis

Component: Ball Screw

Time Period: April 2013 - June 2014

### BACKGROUND

Nye was contacted by iWalk, now known as BionX™ Medical Technologies Inc., a leader in the field of prosthetic devices. The company was working on designing powered "smart" prostheses, in particular an ankle prosthetic. Their design used a small precision ball screw to continually adjust the angle of the prosthetic foot relative to the lower leg. The ball screw is actuated by a battery powered electric motor. iWalk needed our help in maximizing the life of the ball screw while keeping the battery size small. Initial wear tests run by iWalk showed better results from 2 mm ceramic balls than 2 mm steel balls.

For more information, contact our technical expert.

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### CHALLENGE

Which low friction lubricant can help minimize the amount of energy needed to actuate the ball screw while prolonging the operation time of the battery?

### SOLUTION

1. An SRV®4 test simulation was developed by Nye engineers to screen greases with the provided dimensional values for the ball screw components, as well as the range of speeds and forces that the screw could see.
2. Nye set the first test for 2 hours using steel balls. The test only lasted 9 minutes before a catastrophic seizure.
3. The second test used ceramic balls and lasted the full 2 hours. This confirmed the results iWalk was seeing with ceramic vs. steel balls.
4. Nye then tested our highly fortified Rheolube® 374A, which is known to perform well under high shock loads.
5. 374A was first tested with ceramic balls, but failed after only 43 minutes.
6. 374A lasted the full 2 hours when tested with steel balls. A 16 hour re-test showed that 374A performed consistently for the entire length of the test.



Ankle Prosthesis

Lubricant Properties	Rheolube® 374A	Test Method
Base Oil	Lithium Soap	
Thickener	PAO	
Temperature Range	-54°C to 177°C	
Kinematic Viscosity	40°C	121 cst
	100°C	16.9 cSt
4 Ball Wear (1hr, 1200RPM)	40 kg Load	0.44 mm
Penetration	NLGI Grade	2
	Unworked	244
	Worked 60x	267
Low Temp Torque	Starting (-54°C)	6781 g/cm
	Running (1 hr, -54°C)	1879 g/cm
SRV, Step Load	2000 N	ASTM D-5706

### RESULTS

Based on Nye's recommendation, and after some of their own testing, iWalk finalized their ball screw design using steel balls and Rheolube® 374A in their ankle prosthetic.