



# Harmonic and Energy Solutions



Real-world performance  
for real-world loads.



**“Our unique test method for large nuclear safety injection drive turbines utilizes MIRUS equipment in order to prevent harmonics from affecting a nuclear plant’s power distribution system. Testing now can be safely performed under full plant power at a significant savings.”**

Jack Little,  
President, ILD Inc.



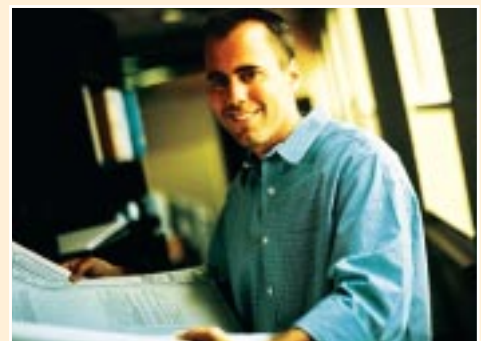
## Power quality solutions you can trust

When your project or process depends on efficient, high quality electrical power distribution, you need solutions that truly deliver. MIRUS designs and manufactures innovative, energy efficient power quality products that meet the needs of all stakeholders in any application where power electronic non-linear loads, such as computers, broadcasting equipment or variable frequency drives, are in use. Engineering consultants tasked with the responsibility of protecting these sensitive loads can rely on us to deliver a full range of products that meet this challenge while delivering the added benefit of energy savings. Electrical contractors can deploy MIRUS solutions confidently, since they are standards compliant, easy to install and fully supported by our organization. And end-use customers can be assured they’re getting the power quality and energy savings they have paid for. MIRUS solutions meet, even exceed, today’s harmonic, environmental and efficiency standards. Whatever your objectives are, MIRUS offers you solutions you can trust.

## Real-world expertise

Since 1991, MIRUS International Inc. has supplied unique power quality solutions to a host of industries for a variety of applications. Using our roots as engineering consultants, we apply our practical problem-solving skills to develop solutions with real-world loads in mind – and real-world challenges. MIRUS finds solutions for the most difficult power problems, designing some of the highest efficiency transformers and harmonic filtering products on the market. To ensure that our customers get the best solutions available, we put our own products to the test. Using our unique Harmonics & Energy Lab, we examine all our product lines under real-world, non-linear load conditions. So what you read in the spec is what you get on-site.

Our expertise is being applied throughout the world with projects completed in Europe, Africa, Asia, Australia, South America and North America.



## A history of innovation

With our reality-based approach to solving power quality challenges, our expert technical staff has achieved a series of distinguished firsts in the industry, including:

- The first application of a zero sequence harmonic filter to remove heavy 3rd harmonic current in a computer intensive, high tech manufacturing facility.
- A patented auto-transformer/filter product often used in broadcasting facilities to lower ground currents and video noise produced by harmonics.
- High Performance Transformers (HPTs) that combine harmonic mitigation with energy savings to meet the needs of today's non-linear loads while saving money and protecting the environment.
- The ONICS™ Harmonic Mitigating Remote Panelboard (HMRP), a unique solution that treats all four of the major current harmonics created by single-phase, power electronic loads by combining proven and reliable passive, electromagnetic filtering with distribution panel boards.

- The LINEATOR™ Advanced Universal Harmonic Filter (AUHF), which has captured a significant portion of the “clean power” Variable Frequency Drive market since its introduction.

MIRUS continues to dedicate substantial time and resources to develop, test and release the best power quality solutions possible. Our innovation drives our growth.

“LINEATOR  
did as promised.”

Peter O'Brien,  
Electrical Engineer  
Chevron



MIRUS solutions  
meet, even exceed,  
today's harmonic,  
environmental and  
efficiency standards.







**“LINEATOR offered premium harmonic attenuation, a reliable passive filter design and system independency.”**

Dave Challoner,  
Natural Gas Sweetening Plant  
British Columbia, Canada

## High performance transformers for high performance buildings

With the renewed focus on energy efficient high performance building projects, MIRUS understands the need for high efficiency, non-linear load compatible transformers that deliver on their promises. And unlike conventional Energy Star transformers, which are only optimized for high efficiency under light loads (35%) and linear loading (60 Hz), MIRUS High Performance Transformers (HPTs) maintain their high efficiency under both linear and non-linear loading over the practical range of 35% to 65% load. To ensure performance levels are met, we factory test our transformers for efficiency under both linear and non-linear loading with independent third party verification of these results. With built-in harmonic mitigation technology, HPTs improve power quality by preventing potentially damaging voltage distortion from developing.

## Meeting the VFD harmonic challenge

As the use of variable frequency drives (VFDs) has increased rapidly in recent years, the concern over current harmonic levels generated by them has increased as well. Traditional methods of harmonic treatment are often unreliable, too costly or only moderately effective. The innovative LINEATOR line of advanced universal harmonic filters (AUHFs) by MIRUS is an uncompromising advance in the area of passive harmonic mitigation.

Using LINEATOR, you can:

- Get 18-Pulse performance from a 6-Pulse VFD by treating all major harmonics generated by these 3-phase rectifier loads.
- Easily apply harmonic filtration to the input of a single VFD or multiple VFDs from a dedicated supply.
- Meet IEEE Std 519 and other applicable harmonic standards for both current and voltage distortion.
- Reduce operating costs by lowering harmonic losses.
- Get the most cost effective, premium harmonic solution for VFDs.

With greater than 99% efficiency, LINEATOR outperforms all other forms of low harmonic (“clean power”) VFD solutions, including 18-Pulse and Active Front-End. With its small



footprint, LINEATOR can be easily installed in its own enclosure ahead of the VFD, incorporated into a motor control center or packaged with the VFD. We factory test all LINEATOR products to ensure they meet their published performance and efficiency levels.

## Making non-linear loads linear

Since the introduction of switch-mode power supplies (SMPS) in computers, broadcasting equipment and other power electronic devices, electrical engineers have looked for a cost effective way of dealing with both the current and voltage harmonic distortion these power supplies create. The ONICS Harmonic Mitigating Remote Panelboard (HMRP) by MIRUS treats all four of the major current harmonics created by SMPS. The HMRP integrates our harmonic mitigating technology with two 42-circuit distribution panelboards, optional monitoring and transient voltage surge suppression (TVSS) in an attractive, easy-to-install package – eliminating overheating of distribution transformers and their neutral conductors. The HMRP

also lowers voltage distortion to increase the reliability of the connected equipment, and reduces operating costs by removing harmonic losses. Savings in upstream cable and transformer initial costs combine with ongoing energy savings to offer you an attractive payback. HMRP is ideal for computer data centers, broadcasting facilities, casinos and any other applications where 120V non-linear loads are abundant. With the HMRP, you get a lot of performance in an easy-to-install, cost effective package.

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HMRP can be used to remove 3rd harmonic neutral and ground currents, reduce voltage distortion and lower video noise in broadcasting applications.





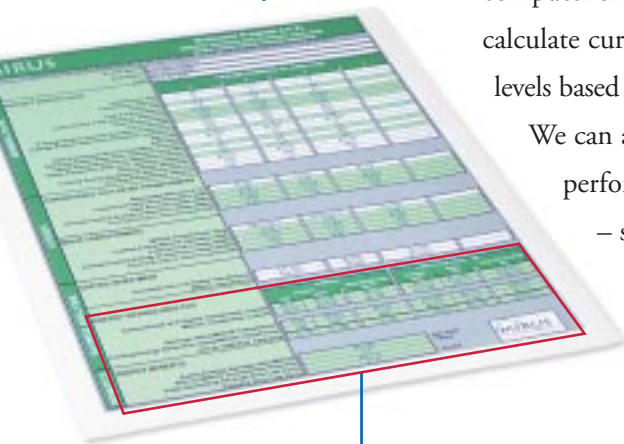
MIRUS products are factory tested under non-linear loading to ensure that the predicted performance and energy savings will be realized.

“From an engineering perspective we have received good support from MIRUS.

Overall they have been a very good vendor.”

Louis Giokas,  
Savanna Depot Technologies,  
Illinois, USA

### EValuator Report



ENERGY SAVINGS ANALYSIS	ANNUAL			LIFE CYCLE (Yrs: 30)		
	Load	Losses	Operating Cost (\$/Yr)	Load	Cost	Total Ownership (\$)
Conventional or K-Rated Transformer Losses	20.75	67,820	\$2,555	1,907,500	13,920	\$25,920
MIRUS Transformer Losses	10.28	48,825	\$1,760	913,488	66,720	\$100,878
Savings using MIRUS Transformer			\$1,235	\$994,012	\$67,176	\$15,042
Cooling Energy Reduction using MIRUS Transformer	3.58	4,631	\$385	\$8,631	\$7,700	\$7,700
<b>TOTAL ENERGY SAVINGS</b>	17.58	51,291	\$1,714	1,895,869	\$74,476	\$85,718
<b>ENERGY BENEFITS</b>						
Yearly Energy Savings with MIRUS			\$1,714			
ROI on MIRUS Transformer Premium			2.5			
Total Ownership Savings Over Life Cycle			\$85,718			
Payback Over Life Cycle			21.8			

Paybacks are easily calculated using our Evaluator Energy Savings Analysis Tool.

## MIRUS: The proven difference

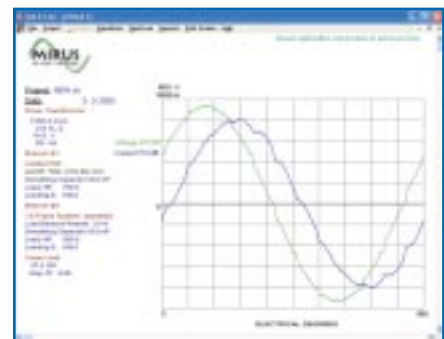
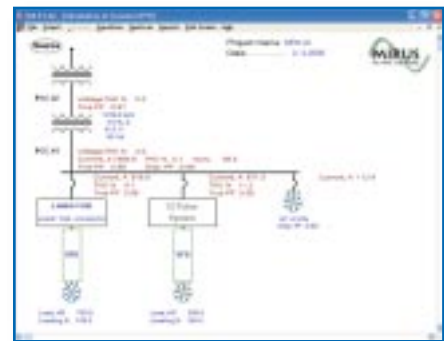
When you choose MIRUS, you get the high level of performance you expect. That’s because we back our claims. Using our unique Harmonics & Energy (H&E) Lab, we can create 1-phase computer type loads or 3-phase variable frequency drive loads, so we can test our products under real-world, non-linear load conditions. We also conduct compatibility testing with all major VFD manufacturers’ products to ensure a trouble-free installation. To help you find the right solution for your VFD application, MIRUS offers our proprietary Simulation of LINEATOR/VFD (SOLV™) computer simulation program that will calculate current and voltage distortion levels based on your load requirements.

We can accurately predict the performance level you can expect – saving you the expense of a costly harmonic study.

And MIRUS can help you determine a justifiable

payback for your High Performance Transformer application through the use of our proprietary EValuator™ Energy Savings Analysis Tool. Depending on load profile and loading level, paybacks of 1 to 4 years can be achieved. From testing to analysis, you know you’re getting the best performance and value from your MIRUS solution.

### Simulation of LINEATOR/VFD (SOLV)



Our computer simulation software (SOLV) helps ensure that IEEE Std 519 harmonic limits are met.



## Global success

Our customers span the globe in a variety of industries. They originally come to us for our unique expertise and return based on the outstanding results we achieve.

### High Tech/Manufacturing

Intel, BASF, IBM, Packard Bell, Hewlett-Packard, Dell Computer, Newbridge Networks, Oracle, Lockheed Martin, General Electric, Kodak, Motorola, Microsoft, Research In Motion, Ericsson, Apple Computers

### Banks/Financial Institutions

Bank of America, JP Morgan, Bank One, CIBC, TD Bank, Harris Bank, Fannie Mae, American Express, Bank of Canada, Toronto Stock Exchange, Montreal Stock Exchange, Royal Bank of Canada, Merrill Lynch, Fidelity Investments, Bank of Montreal, First Interstate Bank of Arizona, GEICO, Bank of Nova Scotia, Nationwide Insurance, Blue Cross / Blue Shield

### Government

U.S. Navy/U.S. Coast Guard, U.S. Naval Research Laboratory, CFS Leitrim, San Diego Naval Station, Public Works Canada, Naval Public Works, Canada Post, Bureau of National Affairs, U.S. Naval Undersea Warfare, U.S. Defense Intelligence Agency, Social Security, Government of Ontario, Brookhaven National Laboratory, Centers for Disease Control, Los Alamos National Laboratory

### Broadcasting/Telecommunications/Entertainment

NBC, HBO, Nortel Networks, Fox, CBC, E! Entertainment TV, Bell Canada, Comcast, Cable and Wireless, Verizon Wireless, Rogers Communications, Rainbow Networks, CTV, CFTO-TV, CKCO-TV, CHFI, The Sports Network, BCD Cincinnati, Crossroads Communications, Intermedia Communications, Southwestern Bell, Telus Communications, AT&T, Cisco Systems, US West Communications, Windsor Casino, Resorts Tower Casino, Casino of the Sun, SkyVenture, ESPNZone, Lucent Technologies

### Industry

GlaxoSmithKline, Conoco, Phillips, Petro Canada, Coors, Alcan, Inco, Pfizer, Pepsi, Chrysler, Ford, Toyota, Honda, TRW, Michelin Tire, Voisey's Bay Nickel Company, Imperial Oil, Syncrude, Exxon, Mobil, Chevron, Dupont, Domtar, Marriott Hotels, Fermi2 Nuclear Power Plant, Port Bolivar Desalination Plant, Dingman Creek Pump Station, Springdale WWTP, Barre WWTP

### Schools/Institutions

University of Toronto, Baylor University, McMaster University, York University, Neshaminy School District, Carlton University, University of British Columbia, Ontario Science Centre, Memorial Hospital, Provena Mercy Hospital, Valley Baptist Medical Center, Millikin University, Arizona State University, Illinois University, Arkansas State University, Evanston Hospital

### Transportation

U.S. Federal Department of Transportation, Smiths Aerospace, Patrick Air Force Base, Manhattan Transfer Edit., McDonnell Douglas, Transport Canada (Montreal, Toronto and Winnipeg international airports), American Airlines, CN Railway, Union Pacific Railroad, Tampa International Airport, Kennedy Space Center, Continental Airlines

We continue to expand into new industries and raise the standards of power quality solutions in every application and wherever non-linear loads are in use.



## Expect more. Call us.

To discuss how MIRUS can help you meet your power quality challenges, contact us at our head office:

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Toll-Free: 1-888-TO MIRUS (888-866-4787)

[www.mirusinternational.com](http://www.mirusinternational.com)



## Protecting the Environment

To promote the financial and environmental benefits of our highly efficient transformer and filtering products, we have aligned ourselves with influential organizations, including:



Energy Star Partners



U.S. Green Building Council &  
Leadership in Energy Efficient Design (LEED)



Rebuild America



Environmental Choice Program (Ecologo)



Smart Schools



MIRUS Harmonic and Energy Solutions: Real-world performance for real-world loads.