

Think Safety First with
Pneumatic Circuit
Design p24

Waste Expo and Offshore
Technology Conference
Previews p36, 42

Low-Speed High-Torque
Motors Help Gobble Up
Debris p40

Hydraulics & Pneumatics®

THE AUTHORITY ON FLUID POWER TECHNOLOGY
AND ITS CONTROL

APRIL 2017 hydraulicspneumatics.com

IN CONTROL

Hydraulics
Locked into
Panama Canal
p31



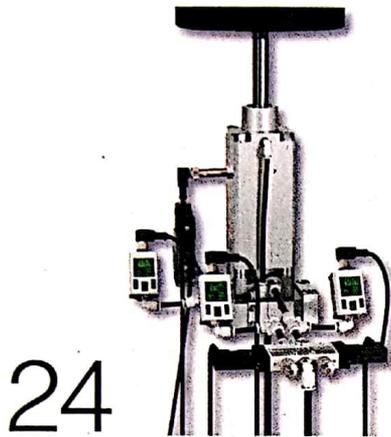
#BXNPZFH*****FIRM 90745
#975975012 9 # HL 006 221 SEP17 C
MARIFE VARGAS
B SOMBORIO
2131 MARBELLA AVE
CARSON CA 90745-1339
0002
S00015

\$10.00 Periodicals Postage Paid - USPS 100 Approved Poly

Powered by Penton®

Modeling
Hydrostatic
Transmissions
P / 18

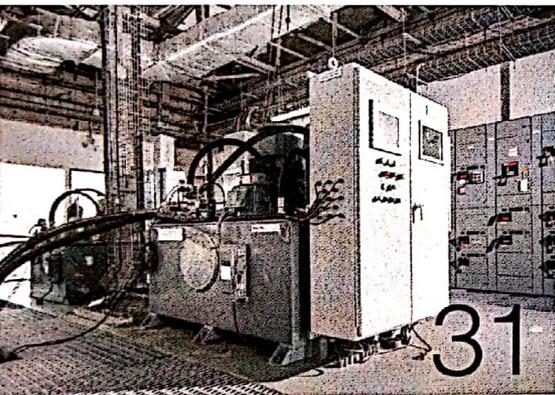
IN THIS ISSUE



24

FEATURES

- 24 Keys to Designing Safe Pneumatic Circuits**
Designing safe pneumatic circuits requires using proven and evaluated techniques and well-established components that have been properly sized for the application.
- 28 Pneumatic Controls: Simple and Reliable**
Pneumatic controls hold many advantages over other methods of control and actuation—easy installation, low cost, and, of course, reliability.
- 31 Global Effort Expands Panama Canal**
Top-notch hydraulic system design and collaboration between multiple countries finally bring the world's largest locks into the millennium.
- 36 A Wealth of Information at Offshore Technology Conference**
Technical sessions and training courses fill out the schedule for attendees at the big event in Houston.
- 40 LSHT Motor Drives Tough Industrial Shredder**
Radial-piston motor delivers high torque and withstands torque spikes to ensure reliability on shredders that process commingled heavy industrial and construction waste.
- 42 Waste Expo Comes Marchin' In to New Orleans**
The event features dozens of exhibitors offering fluid power products.



31

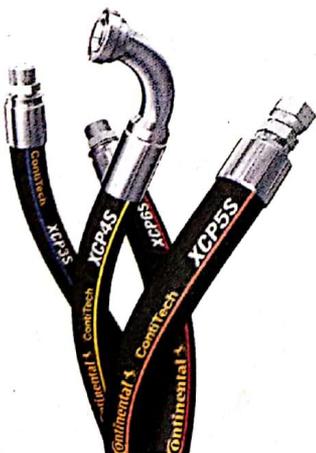


40

DEPARTMENTS

- | | | | |
|-----------|---------------------------------|-----------|----------------------------------|
| 4 | EDITOR'S PAGE | 44 | USEFUL PRODUCTS |
| 8 | INDUSTRY NEWS | 47 | ADVERTISERS INDEX |
| 12 | IDEAS & APPLICATIONS | 48 | TROUBLESHOOTING CHALLENGE |
| 18 | MOTION CONTROL | | |

44



THE FPDA
FLUIDS & CONTROLS NETWORK



JOIN US ONLINE

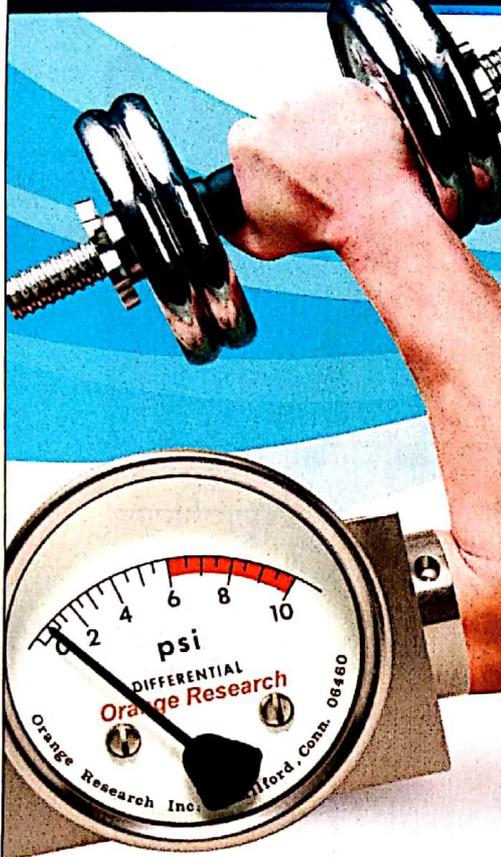
twitter.com/HFPenton

facebook.com/HydraulicsPneumatics

ISSN 0018-814X
Printed in U.S.A. Copyright © 2017 by Penton Media, Inc., all rights reserved. *Hydraulics & Pneumatics* is published monthly by Penton Media, Inc., 9800 Metcalf Ave., Overland Park, KS 66212-2216. Phone: 216-696-7000. Periodicals postage paid at Kansas City, MO and at additional mailing offices. **POSTMASTER:** Send address changes to *Hydraulics & Pneumatics*, 1100 Avenue of the Americas, NY, NY 10036. Copying: permission is granted to users registered with the Copyright Clearance Center Inc. (CCC) to photocopy any article provided base fee of \$1.25 per copy of the article plus 60¢ per page is paid directly to CCC, 222 Rosewood Dr., Danvers, MA 01932 (Code No. 0018-814X/00 \$1.25 + 60¢).

Subscriptions — U.S. and possessions outside U.S.: \$70/yr.; \$100 two yrs. Single copy: January \$15.00; all other issues \$9.00. In Canada: \$85.00/yr.; \$125.00 two yrs. Canada Post Publications Mail Agreement No. 406126089. Canada return address: IMEX Global Solutions, PO box 25542, London, ON, N6C 6B2. International: \$100.00/yr.; \$165.00 two yrs. To order, phone 847-763-9670. Fax orders to 847-763-9673. Send subscription payment to: *Hydraulics & Pneumatics*, P.O. Box 2100, Skokie, IL 60076-7800. Out-of-print copies available in complete volumes as positive microfilm from NAFCO 800-420-6272 x 6578. Photocopies of articles \$5.00 each. Payment must accompany request. Volume 70, No. 4, April 2017.

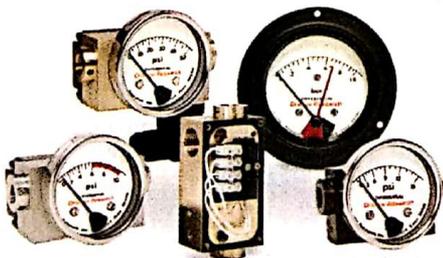
The Strongest Filter Monitors



High Pressure Filter Monitors

Our differential pressure gauges, switches and transmitters provide rugged and reliable performance in the toughest environments, and are:

- rated for static pressures up to 10,000 psi
- coupled magnetically, with no mechanical linkages to break
- machined from solid metal blocks



Orange Research
"the differential pressure people"

203-877-5657
orangeresearch.com

Hydraulics & Pneumatics.

APRIL 2017

EDITORIAL

EDITOR: **ALAN HITCHCOX** alan.hitchcox@penton.com
CONTENT PRODUCTION DIRECTOR: **MICHAEL BROWNE** michael.browne@penton.com
CONTENT PRODUCTION SPECIALIST: **ROGER ENGELKE** roger.engelke@penton.com
PRODUCTION EDITOR: **JEREMY COHEN** jeremy.cohen@penton.com
CONTENT OPTIMIZATION SPECIALIST: **WES SHOCKLEY** wes.shockley@penton.com
ASSOCIATE CONTENT PRODUCER: **LEAH SCULLY** leah.scully@penton.com
CONTRIBUTING EDITOR: **JACK L. JOHNSON** jack@idaseng.com
CONTRIBUTING EDITOR: **ROBERT J. SHEAF, JR.** rjsheaf@cf-solar.com

ART DEPARTMENT

GROUP DESIGN DIRECTOR: **ANTHONY VITOLO** tony.vitolo@penton.com
SENIOR ARTIST: **JIM MILLER** jim.miller@penton.com
CONTENT DESIGN SPECIALIST: **JOCelyn HARTZOG** jocelyn.hartzog@penton.com
CONTENT & DESIGN PRODUCTION MANAGER: **JULIE JANTZER-WARD** julie.jantzer-ward@penton.com

PRODUCTION

PRODUCTION MANAGER: **SUSAN POSKIN** susan.poskin@penton.com
GROUP PRODUCTION DIRECTOR: **CAREY SWEETEN** carey.sweeten@penton.com
PLEASE SEND INSERTION ORDERS TO: orders@penton.com

CIRCULATION LIST RENTALS & CUSTOMER SERVICE

USER MARKETING DIRECTOR: **BRENDA ROODE** brennda.roode@penton.com
USER MARKETING MANAGER: **DEBBIE BRADY** debbie.brady@penton.com
REPRINTS: **BRETT PETILLO** F | 877.652.5295 bpetillo@wrightsmedia.com

LIST RENTAL: SMARTREACH CLIENT SERVICES MANAGER:

JAMES ADDISON T | 212.204.4318 james.addison@penton.com

FREE SUBSCRIPTION/STATUS OF SUBSCRIPTION/ADDRESS CHANGE/MISSING BACK ISSUES:
OMEDA T | 847.513.6022 TOLL FREE | 866.505.7173

SALES REPRESENTATIVES

MANAGING DIRECTOR: **TRACY SMITH** T | 913.967.1324 F | 913.514.6881 tracy.smith@penton.com
NORTH AMERICA ACCOUNTS MANAGER: **RONALD KLIMKO** T | 216.931.9662 ronald.klimko@penton.com

INTERNATIONAL SALES

ITALY: **DIEGO CASIRAGHI** T | +011.390.31.261407 F | +011.390.31.261380 diego@casiraghi-adv.com

GERMANY, AUSTRIA, SWITZERLAND: **CHRISTIAN HOELSCHER** T | +011.49.89.95002778
christian.hoelscher@husonmedia.com

BELGIUM, NETHERLANDS, LUXEMBURG, UNITED KINGDOM, SCANDINAVIA, FRANCE, SPAIN, PORTUGAL:

RACHEL DISANTO T | +011.44.1625.876622 M | +011.44.7794.366887 rachel.disanto@husonmedia.com

PAN ASIA: **HELEN LAI** T | 866.2.2727.7799 F | 866.2.2728.3686 helen@twoway-com.com

ONLINE

MARKETING AUTOMATION SPECIALIST: **DAN KRAFT** dan.kraft@penton.com
PRODUCT DEVELOPMENT DIRECTOR: **RYAN MALEC** ryan.malec@penton.com
EMEDIA CLIENT SERVICE MANAGER: **JOANN MARTIN** joann.martin@penton.com

DESIGN ENGINEERING & SOURCING GROUP

EXECUTIVE DIRECTOR OF CONTENT AND USER ENGAGEMENT: **NANCY K. FRIEDRICH**
GROUP DIRECTOR OF OPERATIONS: **CHRISTINA CAVANO**
GROUP DIRECTOR OF MARKETING: **JANE COOPER**

PENTON

1166 AVENUE OF THE AMERICAS, 10TH FLOOR
NEW YORK, NY 10036 T | 212.204.4200

Penton®

Electronic Design | Machine Design | Microwaves & RF | Source ESB | Hydraulics & Pneumatics |
Global Purchasing | Distribution Resource | Power Electronics | Defense Electronics

PENTON IS AN INFORMA BUSINESS



Pressure Sensors Feature Digital Display

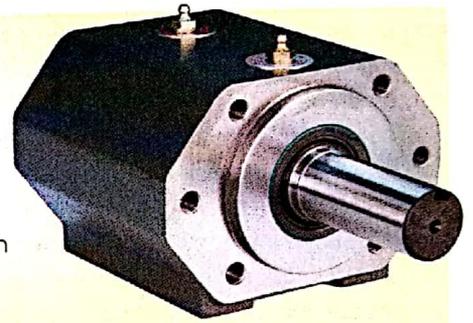
PROSENSE EPS pressure sensors feature a digital display configurable to bar, mbar, kPa, MPa, inches of water column, and inches of mercury. Targeting industrial gas and liquid applications, the stainless-steel housing is rated to IP67 ingress protection, and withstands extreme shock and vibration. The sensors indicate pressure ranges from vacuum to 5,800 psig, and incorporate overpressure, burst pressure, and long-term stability into each range. Atmospheric pressure is referenced at the 4-pin M12 electrical connection. Models are available with two solid-state switch outputs, or with one solid-state and one scalable analog output.

AUTOMATION DIRECT, (800) 633-0405, www.automationdirect.com

Load Adaptor Supports Axial Loads in Hydraulic Motors

THE MODEL 650 overhung load adaptor leverages heavy-duty bearings, a longer profile, and a strong steel shaft for more radial and axial load support in hydraulic motors and pumps. Featuring a cast-iron housing and heavy-duty spherical roller bearings rated at 130,000 psi, it can handle speeds up to 3,500 rpm. The protect-the-shaft-seal of the motor improves the operational life in harsh environment applications.

ZERO-MAX, (800) 533-1731, www.zero-max.com



Advertisers Index

ACL SRL	20	MOTION INDUSTRIES.....	19
AIRTAC INTERNATIONAL GROUP	25	MP FILTRI	11
ANCHOR FLUID POWER.....	45	NOSHOK INC.....	10
BIMBA MANUFACTURING CO.	13	O'KEEFE CONTROLS, INC.....	33
BOSCH REXROTH	23	OP SRL	15
CANFIELD INDUSTRIES.....	30	ORANGE RESEARCH INC.....	6
CERTAGS.....	38	PENINSULAR CYLINDER.....	3
CFC TRAINING INSTITUTE.....	46	ROTOR CLIP CO.....	29
CLIPPARD INSTRUMENT LAB INC.....	27	SANTEST CO LTD.....	37
DEMAC.....	35	SC HYDRAULICS ENGINEERING CORP.....	37
DOERING CO.....	16	SPECTRONICS CORP.....	21
DYNASET OY.....	30	THE LEE COMPANY	9
EATON FILTRATION.....	46	TOMPKINS INDUSTRIES INC.....	IFC,43
FOR SPA.....	14	VELJAN HYDRAIR LTD	1
FREUDENBERG SE.....	7	WASTE EXPO.....	17
HAWE HYDRAULICS	IBC	WILKES & MCLEAN LTD.....	14
HYDRAULEX GLOBAL.....	34		
HYDRAULICS INC.....	44		
KAWASAKI PRECISION MACHINERY OF AMERICA.....	39		

Although every effort has been made to ensure the accuracy of this index, the publisher cannot be held responsible for any errors or omissions.