



The Changing Workforce

CIBO 2016
Woodstock Vermont

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PanGlobal Training Systems



The Changing Workforce

- **Operator Training: An On-going Need**
 - **Costs of Not Training**
 - **Unified Operator Certification**
 - **Demographics**
 - Boomers
 - Millennials
- **How PanGlobal supports Energy Sector Operator Learning**



OPERATOR TRAINING: AN ONGOING NEED



The Cost of Not Training

- **Operating Costs**
 - Inefficiency
 - Forced Outages
 - Insurance
 - Equipment loss
 - Injury/loss of life
- **Safety Costs**
- **Maintenance Costs**
- **Staff Turnover Risks**





Ever-Changing Training Needs

- **Environmental litigation**
 - **GHG Regulations**
 - **CEMS/Emissions Monitoring/Reporting**
- **Cross-state air pollution**
- **Clean Air Act**
- **Clean Water Act**





Ever-Changing Training Needs

- **Emerging/Advancing Technologies**
 - Coal ash disposal
 - Carbon capture/sequestration
 - Operator Interfaces
 - Burner Management
- **Safety/Litigation**





Ever-Changing Training Needs



- **Operator Core Education**
 - Boiler fundamentals education
 - Operator training and controls interface
 - Operator Licensing and Certification
 - Operator Training and Certification
 - Energy Efficiency



Forced Outages

- 3 to 4.5 times the cost of planned outages.
- 100 times the cost if outage is at peak time
- Costly forced outage insurance



Safety/Maintenance Costs

Plant Safety Costs

- Steel Corp training initiatives
 - safety-awareness training
 - hands-on workstation training
 - certifying all plant supervisors in OSHA Standards
- In 3 years, recordable incidents fell 63 percent

Maintenance Costs

- Pulp mill developed a preventative maintenance team
- Classroom and field training on tools, techniques, rationale and benefits of PM
- In 2 years, a 30 percent reduction in lost production due to breakdowns, translating into \$3.54 million per year.

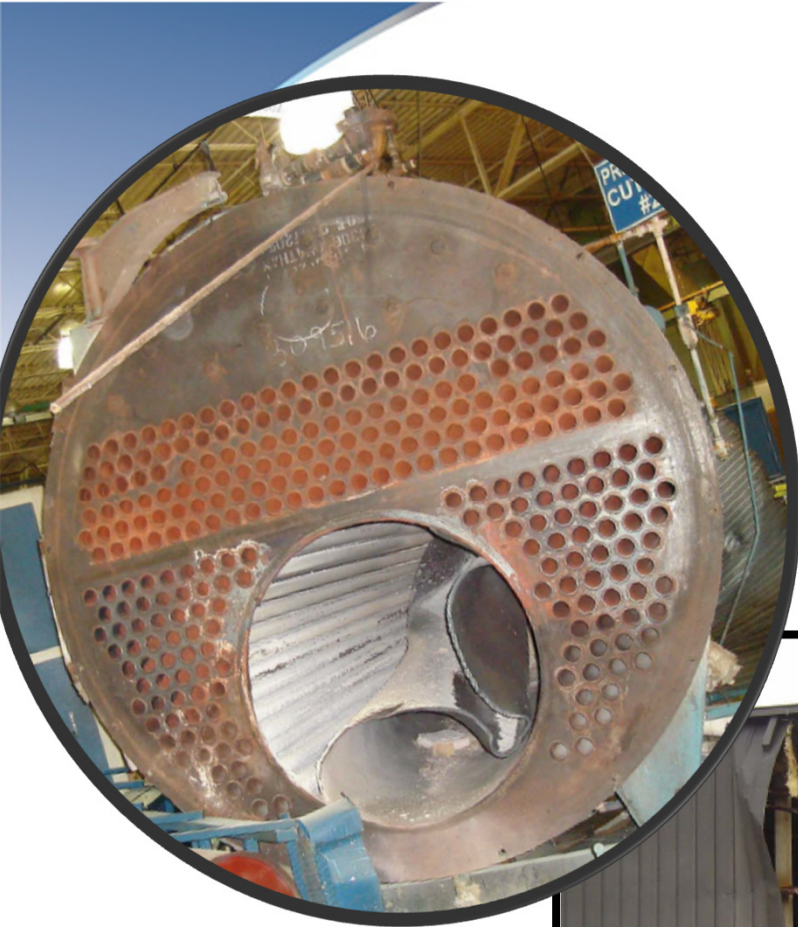


Why Train Operators?

Operator Error

- ***National Board Incident Report*** for 2000, **operator error** and **poor maintenance** cause:
 - 42% of reported power boiler incidents,
 - 39% of steam heating boiler incidents,
 - 42% of water heating boiler incidents, and
 - 76% of unfired pressure vessel incidents.
- ***National Board Incident Report*** for 1993
 - **79% of all boiler accidents for power boilers and heating boilers were attributable to just two causes: low water cutoffs, and operator error/poor maintenance.**

Dana Corporation Paris Tennessee June 18, 2007





Dana Corporation Paris Extrusion Plant Paris, Tennessee June 18, 2007





Dana Corporation
Paris Extrusion Plant
Paris, Tennessee June 18, 2007

**STATE OF TENNESSEE DEPARTMENT OF LABOR AND
WORKFORCE DEVELOPMENT DIVISION OF BOILER AND
ELEVATOR INSPECTION**

“The main cause of the boiler accident was **improper maintenance** and the **lack of operational procedures** of the boilers. In addition, removal and replacement of critical controls and safety devices, along with the **lack of proper training and qualified personnel** equally contributed to the occurrence of the accident.”



Why Train Operators?

Three-prong approach to boiler and pressure vessel safety

- I. Safe engineering **design** (ASME)
- II. Safe and consistent **manufacturing** (NBBI)
- III. Skilled and **trained operators**





Staff Turnover

A 2005 study on the aging workforce trends at U.S. coal-fired power plants

- the average age of the power plant workforce is 48.
- an average coal-fired plant will likely lose half its current plant staff in the next decade due to retirement and attrition.
- the specialized labor to replace this talent pool will likely be in short supply and difficult to recruit.

American Public Power Association - 2006

- “the loss of critical knowledge and the inability to find replacements with utility-specific skills are the two biggest challenges facing the industry. As a result, the utility industry will be hit very hard, very quickly by the shortage of skilled workers. That’s because the average age of utility workers is almost 50, several years older than the national average, and 45 percent of the workforce in electric and natural gas utilities are expected to reach retirement in the next several years.”



UNIFIED OPERATOR CERTIFICATION



Uniform Regulation: American Attitudes

- **3 states are not NBBI** members
- **1 state has not adopted ASME** code
 - **Political will** toward enacting laws regulations.
 - Reluctance to relinquish state-level autonomy and harmonize.
 - **State vs. federal control**
 - **Suspicion toward regulation** and state control.
Totalitarianism vs. Democracy
 - Prefer a **free market approach**. Owner has vested interest for safety. The safe businesses survive.
 - **Necessity?**
- What does this mean for uniform boiler operator certification?



A Single National Operator Certification?

- Reality Check:
 - Limited agreement on content and curriculum between jurisdictions (state/civic), and private industry
 - Limited portability of licenses
 - Limited agreement on **NECESSITY**
- Will the future operator require compulsory National certification?



The Future of Compulsory US Operator Certification

- Operator certification will continue to be regulated in states and cities that consider it to be a key aspect of public safety.





The Future of Compulsory US Operator Certification

- Jurisdictions will **only** adopt compulsory certification voluntarily.
- Jurisdictions **may** see the benefit to uniform operator certification, and adopt NIULPE.
- **Corporate training and certification is and will continue to be paramount** in jurisdictions that have not adopted compulsory certification





The Future of Compulsory US Operator Certification

“Ultimately, the question is not about the delivery and licensing model. What is **INDISPUTABLE** is the **NECESSITY** of **COMPREHENSIVE, RELEVANT** and **THOROUGH** operator training.”

- David Kinasevych, 2016

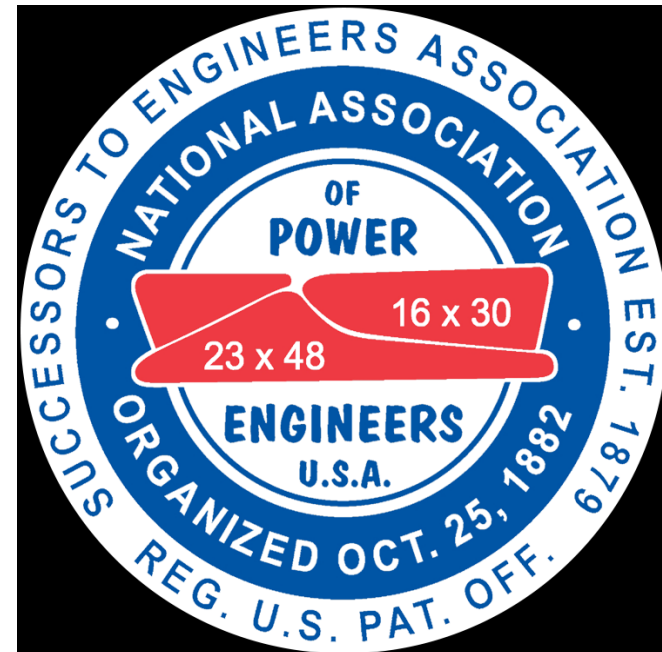


Organizations that Support Operator Training and Licensing: NIULPE and NAPE

- **NIULPE** approach has been to support **voluntary** jurisdictional adoption of operator licensing
- **NAPE** has more of an **operator education/training** mandate



National Institute for the
Uniform Licensing of
Power Engineers, Inc.





The Changing Workforce: Uniform Licencing?

- Will a movement gain traction?
- What would license portability look like in the USA?
- What could or would bring about unified boiler operator licensing?
- Would the country benefit?



Boomers and Millennials

THE CHANGING WORKFORCE: DEMOGRAPHICS

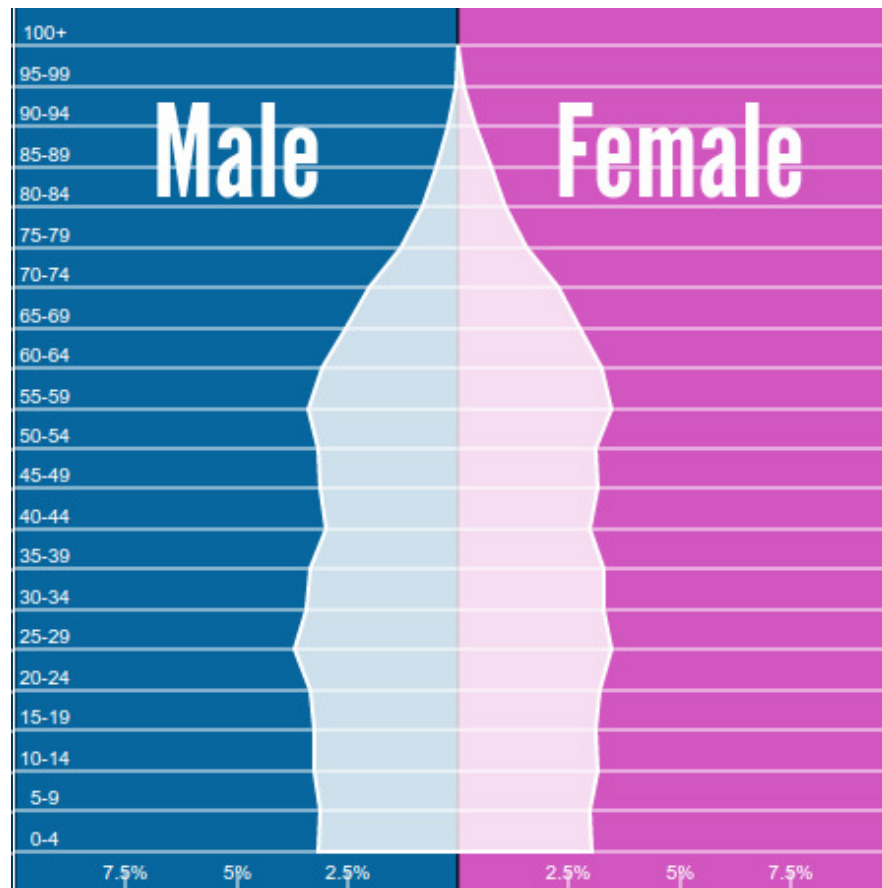


Baby Boomers

- Boomers are now reaching retirement
 - Process/equipment knowledge and experience **must be retained and transferred** to younger operators
 - **Mentors** (informal educators) and **Trainers** (formal educators)
 - Old guys need to **continually learn the new stuff** so they have the lexicon to transfer their information to the new hires:
 - Equipment
 - Procedures
 - Instruments
- **OLD GUYS MUST be SMEs!** New generation will call them on stuff.



American Population Statistics 2009 - 2019





Canada's SOPEEC model

- **Standardization of Power Engineering Examination Committee.**
- Sub-committee of the **Association of Chief Inspectors**
- Power Engineers have uniform licensing and certification exams
- Power plants have fairly uniform classification models, according to boiler capacity (horsepower/therm-hours/kW rating/heating surface)

Plant Class	Chief	Shift Engineer	Assistant Shift Engineer
1	1 st Class	1 st or 2 nd Class	1 st , 2 nd or 3 rd Class
2	1 st or 2 nd Class	1 st , 2 nd or 3 rd Class	1 st , 2 nd , 3 rd or 4 th Class
3	1 st , 2 nd or 3 rd Class	1 st , 2 nd , 3 rd or 4 th Class	
4	1 st , 2 nd , 3 rd or 4 th Class		



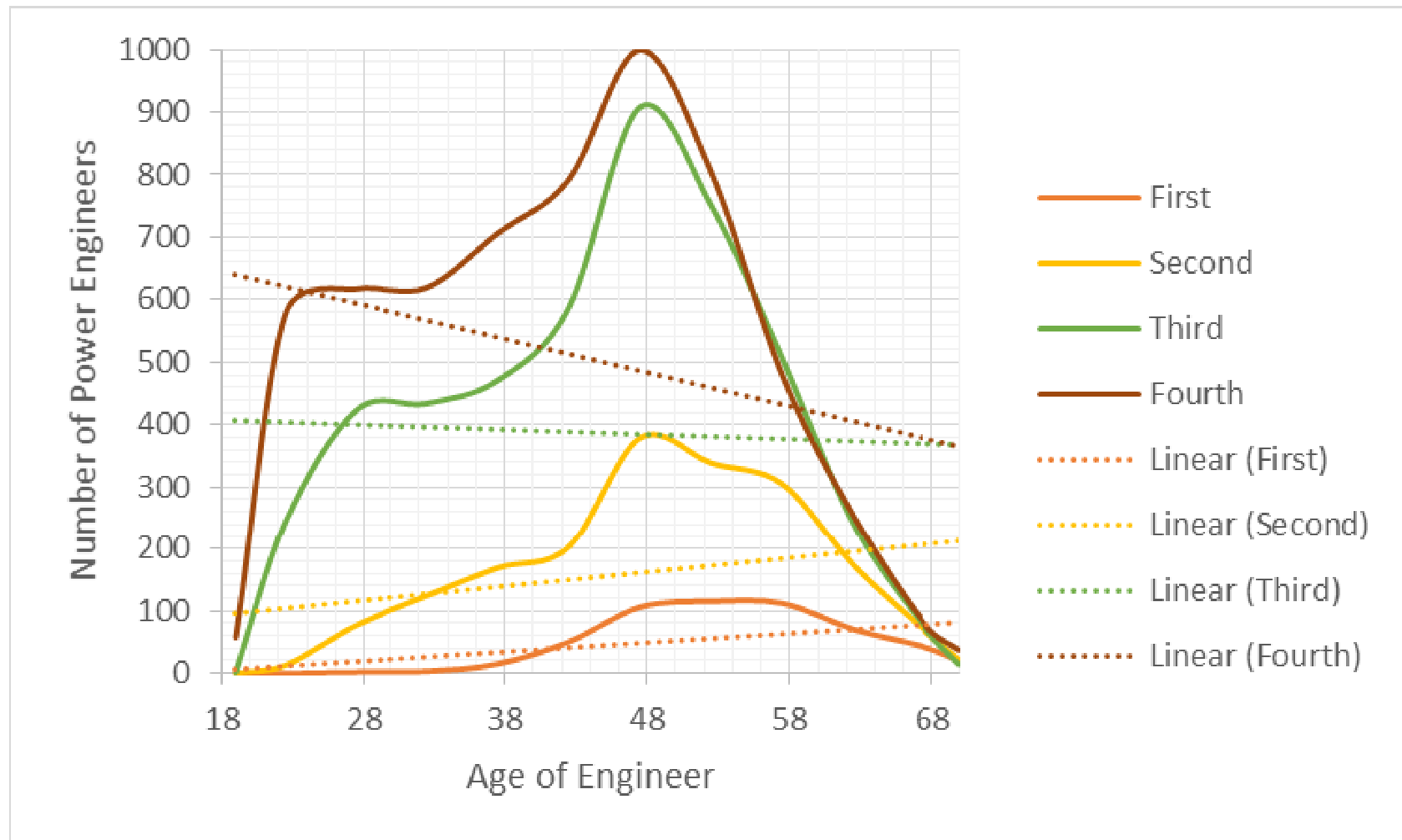
Canada's SOPEEC model

- The curriculum is **Industry and Educator Validated** through **IPECC**: Inter-Provincial Power Engineer Curriculum Committee

Plant Class	Chief	Shift Engineer	Assistant Shift Engineer
1	1 st Class	1 st or 2 nd Class	1 st , 2 nd or 3 rd Class
2	1 st or 2 nd Class	1 st , 2 nd or 3 rd Class	1 st , 2 nd , 3 rd or 4 th Class
3	1 st , 2 nd or 3 rd Class	1 st , 2 nd , 3 rd or 4 th Class	
4	1 st , 2 nd , 3 rd or 4 th Class		



Alberta Power Engineer Statistics 2009





Operator Training

- Pre-hires
- New Hires
- Junior Operators
- Senior Operators





Operator Training

Pre-hires

- Centre for Energy Workforce Development (CEWD)
- National Energy Education Development Project (NEED)
- National Energy Education Network (NEEN)





Operator Training

- Pre-hires
 - School-based Formal Instruction
 - Community colleges/Polytechnics
 - Junior High and High schools
 - Results in Institutional Certification/Accreditation
 - MAY lead to Jurisdictional licensing
 - National Energy Education Network (NEEN)



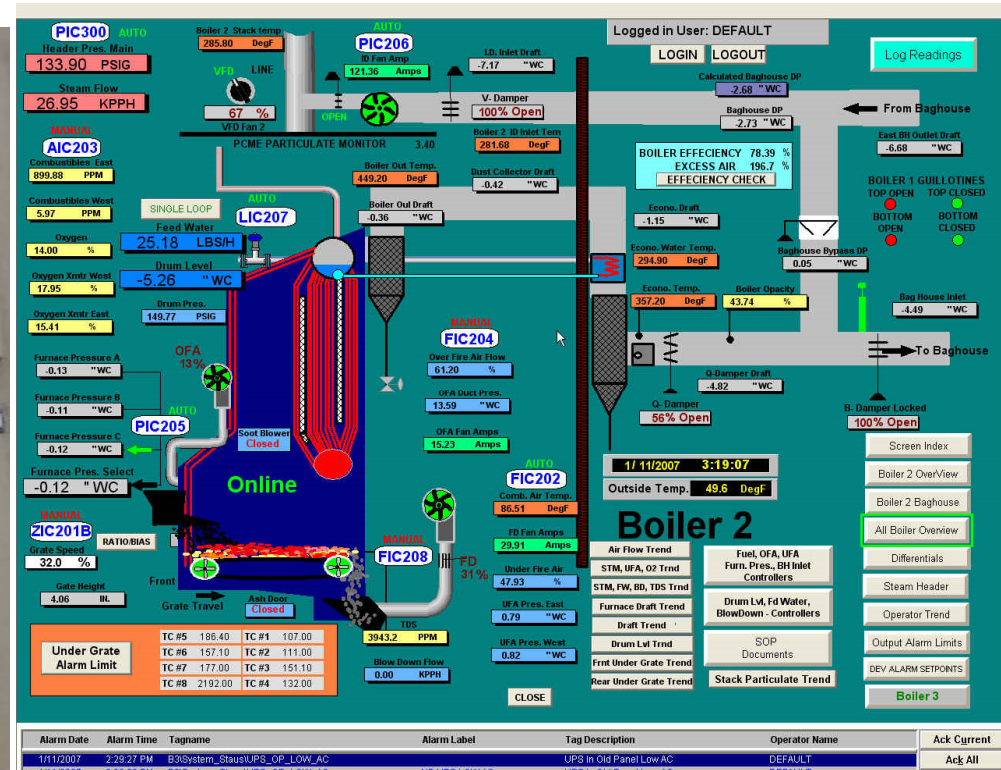
Operator Training

- New Hires and Junior Operators
 - Lifelong
 - Formal
 - Certification/Accreditation
 - Jurisdictional licensing
 - MAY be site-specific and/or meet external validation standards
 - May lead to career advancement
 - Informal
 - Mentoring and Corporate Enculturation by Senior Operators.
 - VERY IMPORTANT!



Senior Operator Training in the Changing Workforce

- Power Engineer careers can last 45 years
- Compare power plant technology today versus 45 years ago





Senior Operator Training in the Changing Workforce

- The operating “envelope” is shrinking, making the plant inherently more complex to operate.
- Changes to plant design and/or operational mission tend to place a larger burden on plant staff.
- Implementation of advanced technologies and data integration requires new skill sets not traditionally available in the fossil industry.
- Impacts and results of new unit mission profiles need to be learned and communicated across the industry to enable effective fleet management.

Electric Power Research Institute 2015



Senior Operator Training in the Changing Workforce

“A company needs to stay on top of training... Like anything else, operator skills go out of date quickly because changes are made in most operations fairly frequently. Skills become stale if they are not used often. Plants that are highly automated present many opportunities for operator skills to atrophy.”

***Pete Henderson, Senior Product Manager
UniSim Product Line, Honeywell.***



Senior Operator Training in the Changing Workforce

“Facility managers cannot look to technical solutions for all energy use problems. In fact, many problems stem from lack of training related to system optimization or ineffective training programs. Establishing effective, low-cost, low-tech training and maintenance program within a plant can prevent the seemingly endless cycle of fighting recurring problems.”

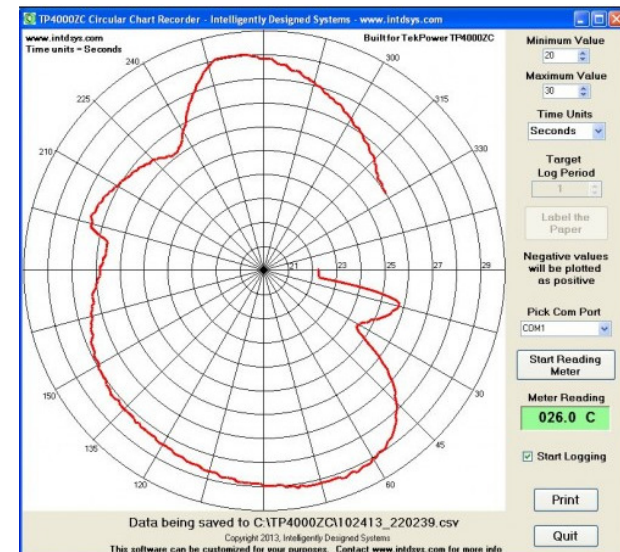
The Human Side of Efficiency: The Value of Training in Plant Systems
Optimization”

Rachel Madan, Industrial Program Associate
Alliance to Save Energy, Washington, DC



Senior Operator Training

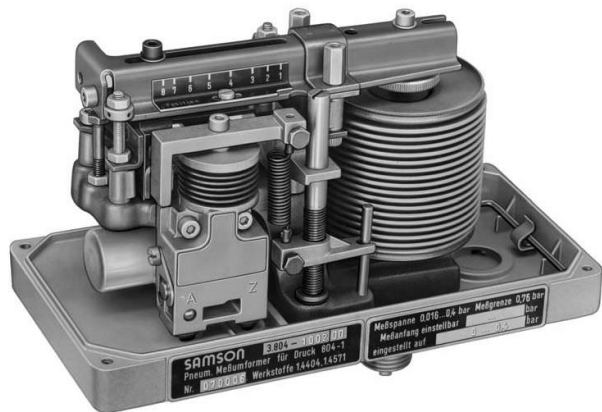
- Has been and continues to be a **Lifelong Learner**
- Corporate/formal training for **position advancement**
- Corporate/formal training for **Jurisdictional requirements**
- May involve **certification advancement for position advancement**





Today's Training Challenges

- **Accommodation** for shift workers
 - 24 hour program delivery/distance learning
 - Blackboard Collaborate and community colleges offer flexible virtual classroom instructional delivery
 - Blended Delivery
 - Study time at work/on shift
 - Back-filling positions to permit education time-off
 - Equipment specific training
- **Budget**





Neophyte Operators: the Millennials





Neophyte Operators: Millennials

- ✓ **Highly educated**
- ✓ **Tech savvy.** Will rapidly learn new control systems, handheld devices for field operation, etc.
- ✓ **Multi-taskers**
- ✓ **Sense of Justice**
 - Environmental concerns
 - Workplace Bullying
- ✓ **Sceptical**
 - don't take information at face value
 - will drill-down and do research on technical matters (they know how to access information).
- ✓ **Liberal/politically correct.** Knowledge and Truth are subjective rather than objective



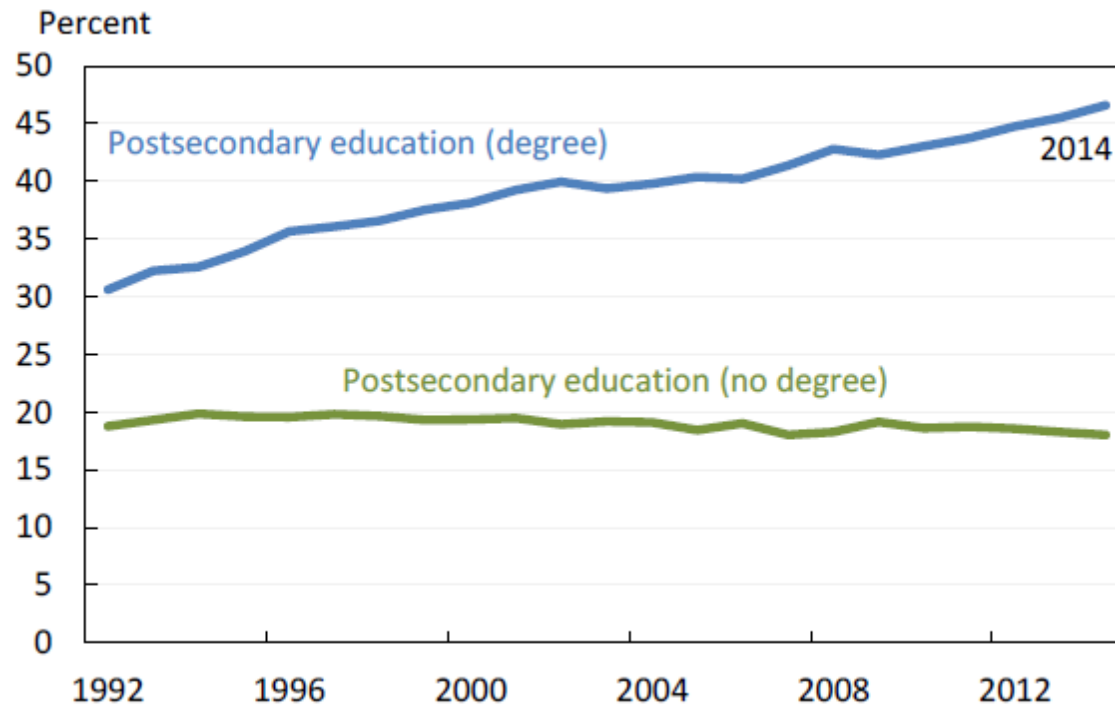
Neophyte Operators: Millennials

- Fact or Myth?
 - Sense of entitlement?
 - Start at the top?
 - Easy-button generation?
 - Less loyal?
- This is the need for Corporate/Career Enculturation and Mentorship.



Highly Educated: Demonstrated Ability to Learn

Figure 6: People Ages 25 to 34 By Educational Attainment,



Source: Current Population Survey; CEA calculations.



Millennial Learning Preferences

- **Most respondents agreed (86%) they prefer PowerPoint slides along with lectures.**
- **I learn from video clips. 86.8% agreed**
- **I like a mixture of activities (lecture, group, work, discussion, problem solving) in a large class 91.3% agreed**
- **Solving problems in class helps me learn 92.3% agreed**
- **Frequent quizzes are a good idea. 80.2% agreed**

Nicholas, Arlene, "Preferred Learning Methods of the Millennial Generation" (2008).
Faculty and Staff - Articles & Papers. Paper 18. Salve Regina University



Millennial Learning Preferences

- I prefer **lecture** format: **62.6% agreed**
- I consider **class discussion** in small groups with other students to be a valuable way to learn the course material. **63.6% agreed**
- Working with other students on an **in-class activity** helps me feel more prepared to participate in **class discussions**. **72.5%**
- Doing **group work** in class is a valuable way to learn material. **72.3% agreed**
- I prefer **multiple-choice exams** compared with essay exams. **84.6% agreed**

Nicholas, Arlene, "Preferred Learning Methods of the Millennial Generation" (2008).
Faculty and Staff - Articles & Papers. Paper 18. Salve Regina University



How to Train Millennials?

Sound Andragogy

- **Enculturate.**
 - “Buy-in” to company and career: sell the company mission, vision and values
 - Mentoring
- **Life-long learning.**
 - They don’t know it all.
 - 50 years of technology per career
- **Give them current technology**
 - On-line learning
 - IPad/Android device support
 - LMS
 - E-books
 - Simulator time



How to Teach Millennials?

Sound Andragogy

- **Give them quality relevant learning materials**
 - Millennials respect expertise
- **Give them Variety**
 - Texts
 - Simulators
 - Videos
 - Practice Question banks
 - Work Experience (on the job)
- **Motivate**
 - Advancement Opportunity
 - Training Opportunity
 - Credentials
- **Accommodate**
 - Shift Schedules
 - Learning preferences. (mix it up)

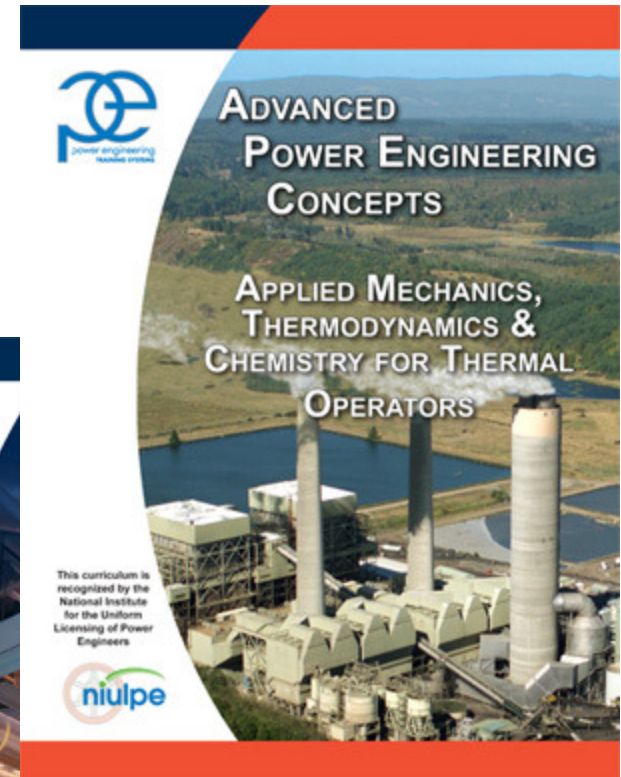


HOW PANGLOBAL SUPPORTS ENERGY SECTOR OPERATOR LEARNING



How PanGlobal can help

- **Life-long learning**
 - PanGlobal keeps abreast of technology by submitting its content to ANNUAL 3rd party educator, jurisdiction and industry validation. Remember 50 years of technological change per career?



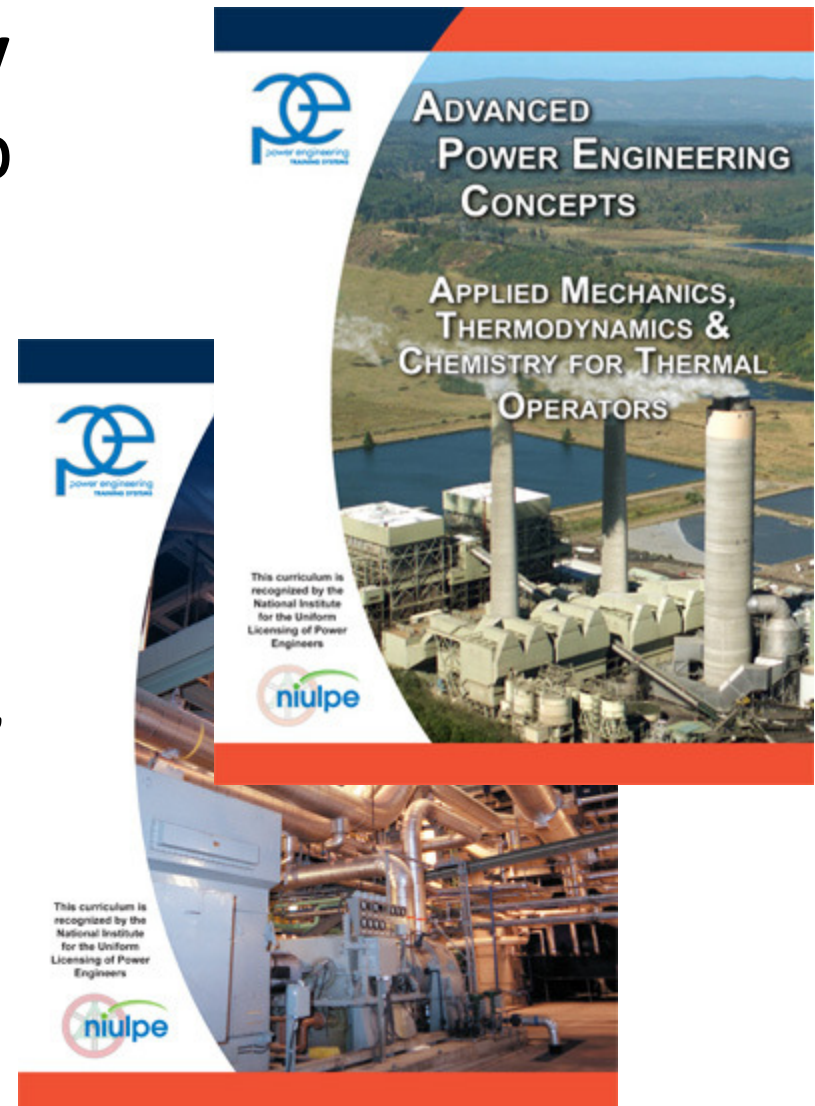
This curriculum is recognized by the National Institute for the Uniform Licensing of Power Engineers





How PanGlobal can help

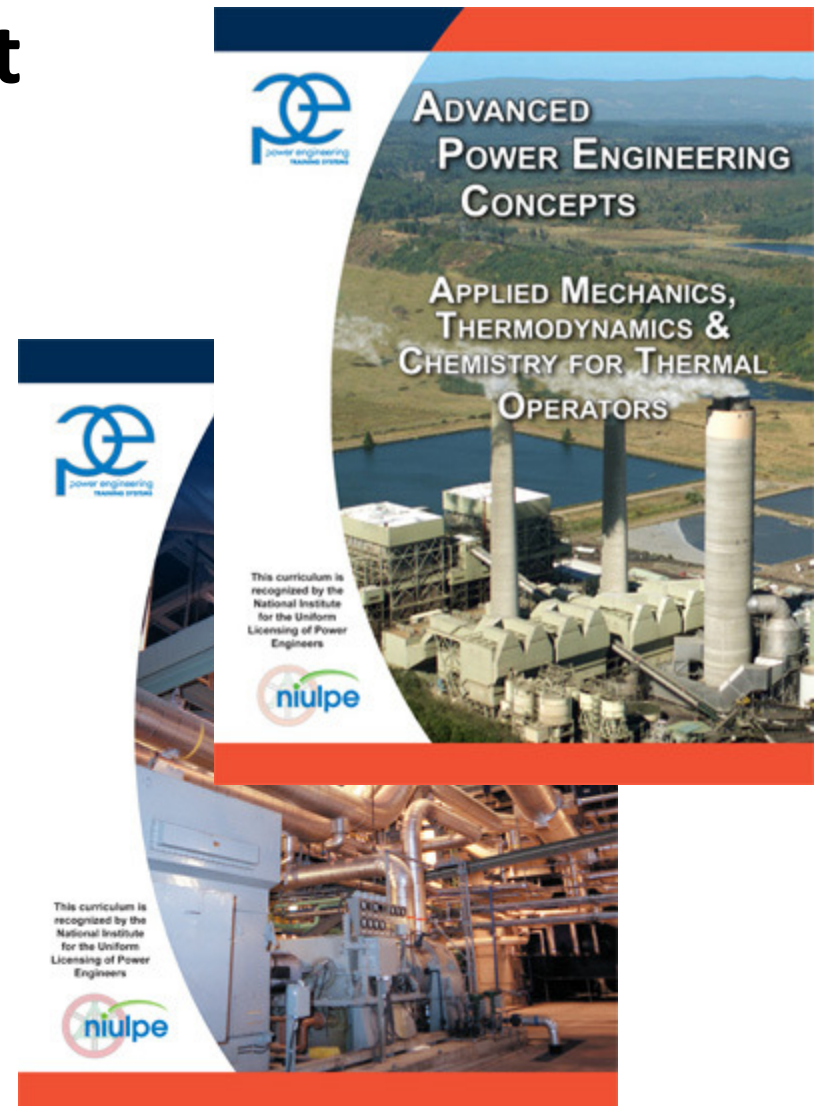
- **Give them current technology**
 - PanGlobal strives to keep content up-to-date
 - PanGlobal provides on-line learning tools that support individual and institutional use
 - PanGlobal supports iPad, Android, PC and Mac
 - LMS
 - eBooks





How PanGlobal can help

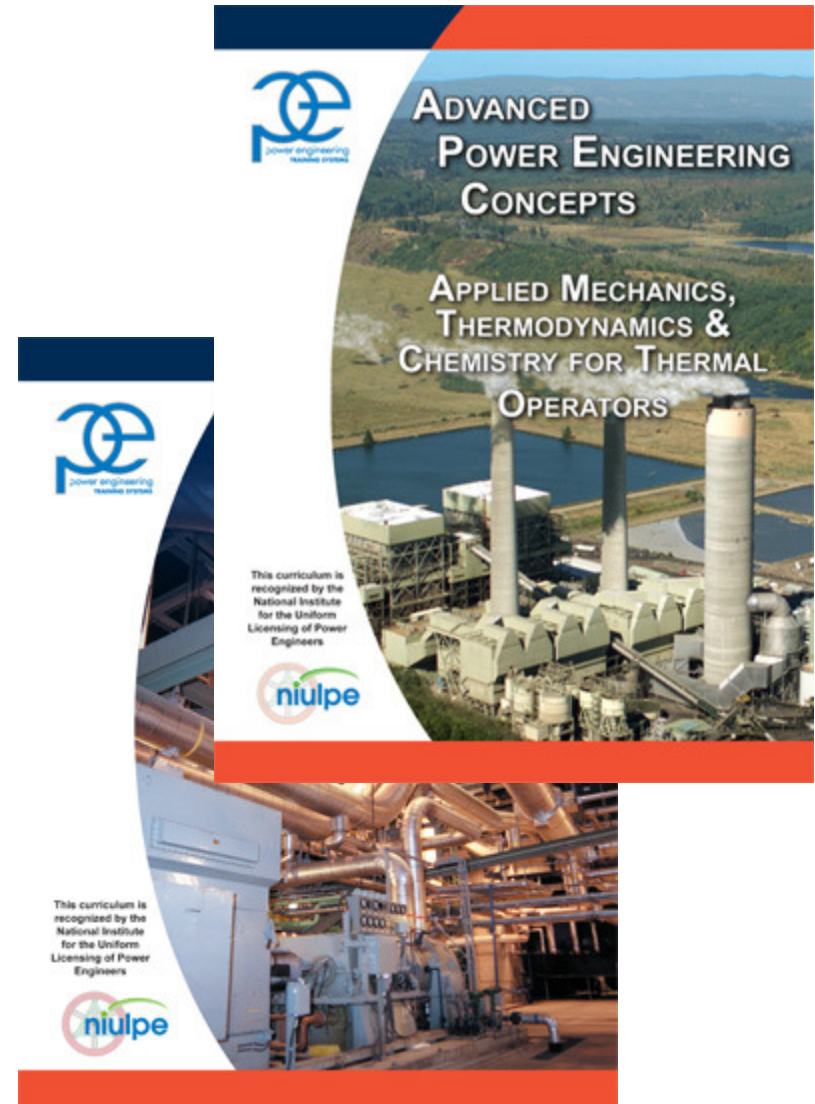
- **Give them quality relevant learning materials**
 - PanGlobal has a team of in-house subject matter experts (Power Engineers AND Educators) who rigorously
 - evaluate content for relevancy,
 - edit for technical accuracy, and
 - author for understanding





How PanGlobal can help

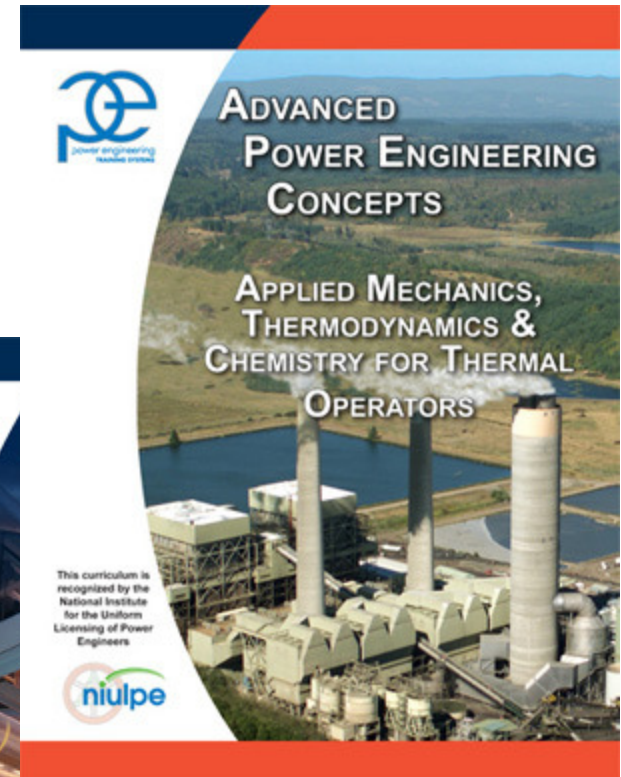
- **Give them Variety**
 - PanGlobal produces
 - Paper and eBook texts
 - Videos
 - Practice Question banks.
 - Fully functional LMSs





PanGlobal's Offerings: US/International Certification Support

- NIULPE-endorsed Textbooks, covering all NIULPE certification levels for Power Engineering
 - Available in Print
 - Available in eBook
 - Purchase
 - Subscription



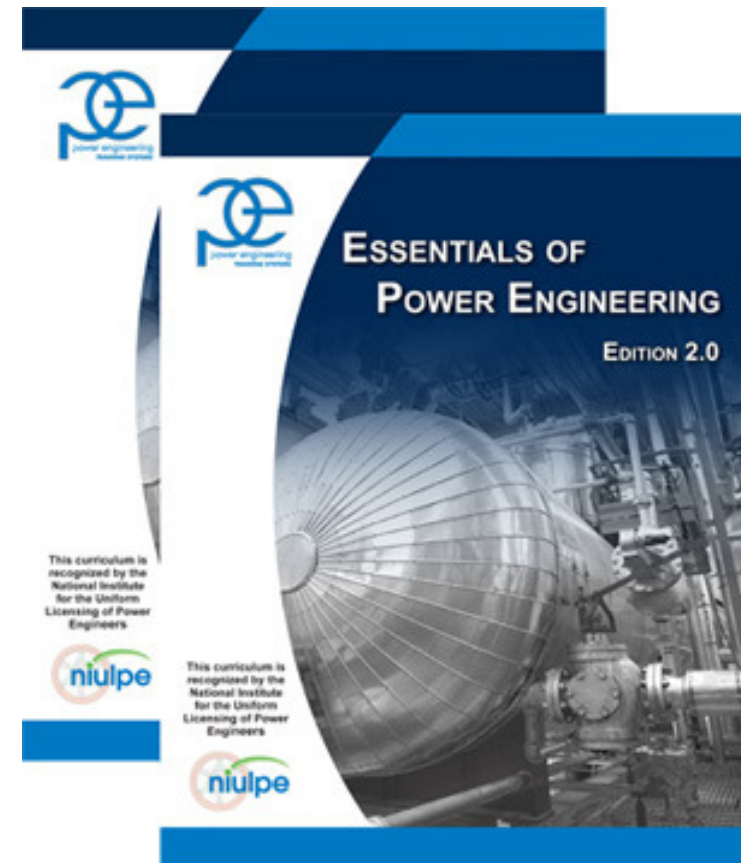
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PanGlobal's Offerings: US/International Certification Support

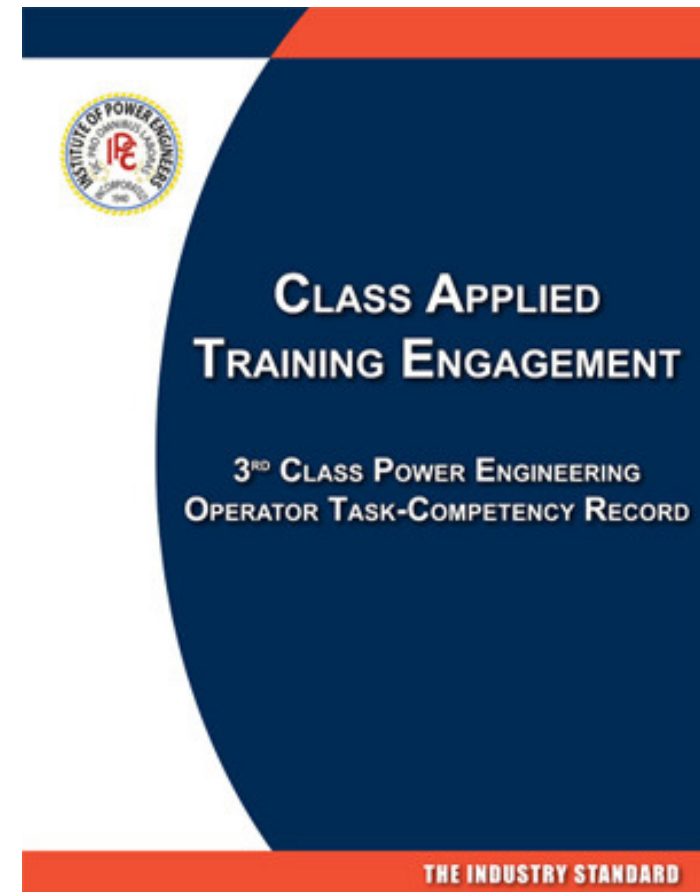
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- **Task Competency Logbook**





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- **ASME Academic Supplement**
 - Sections 1, 2D, 4, 8, 9
 - B31.1 and B31.3

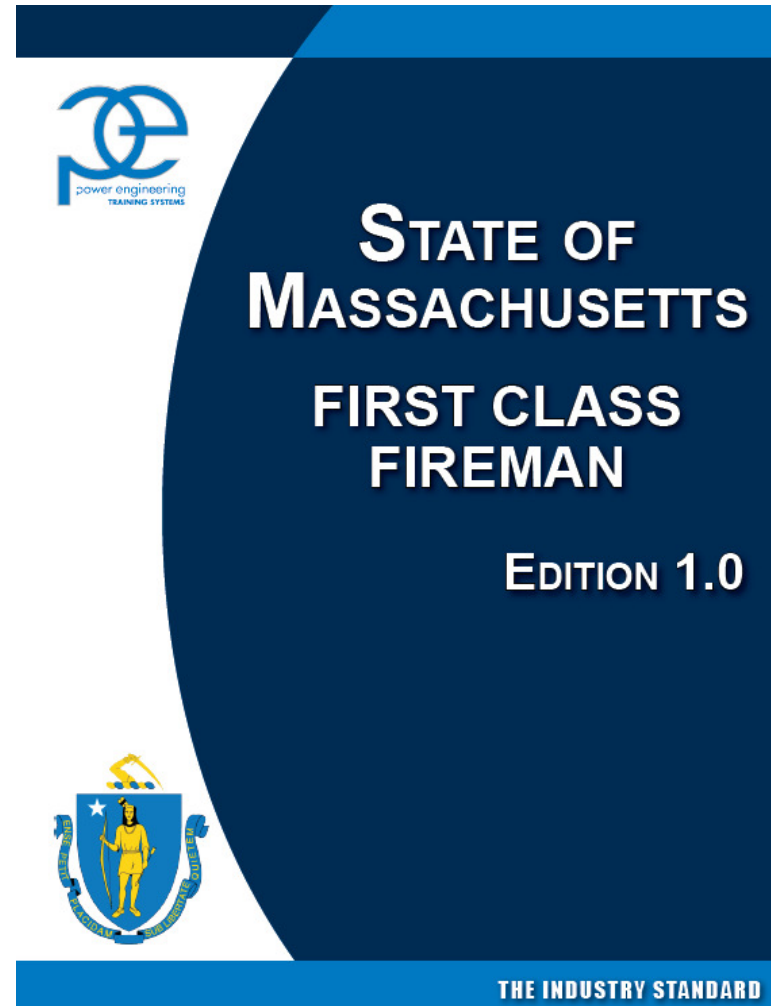




PanGlobal's Offerings: Custom Certification Support

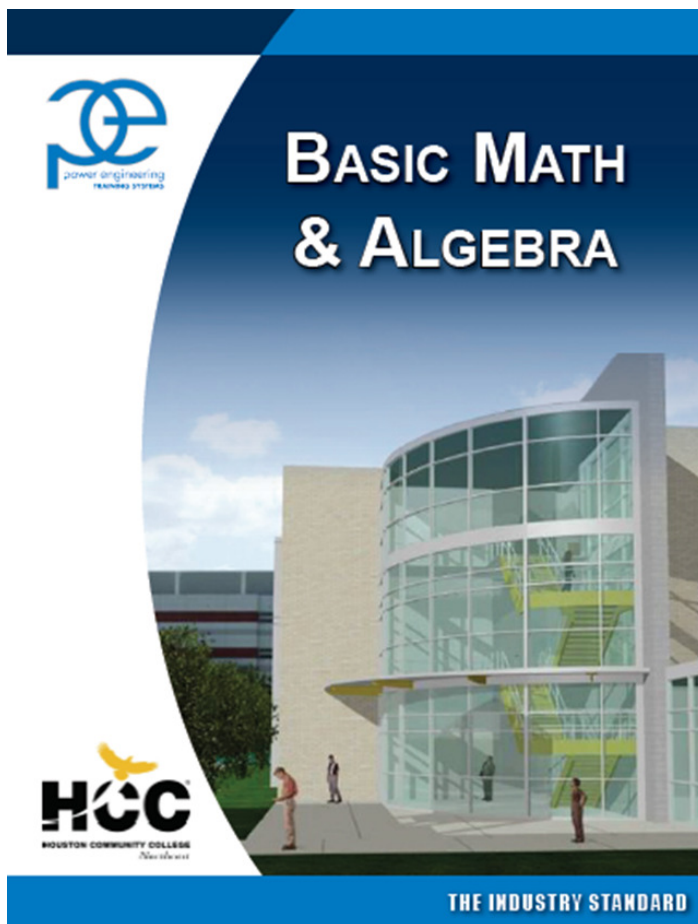
– Jurisdiction-specific custom Power Engineering Products

- Textbooks
- Workbooks
- Logbooks





PanGlobal's Offerings: Custom Accreditation Support



Educational Institution Custom Power Engineering Products

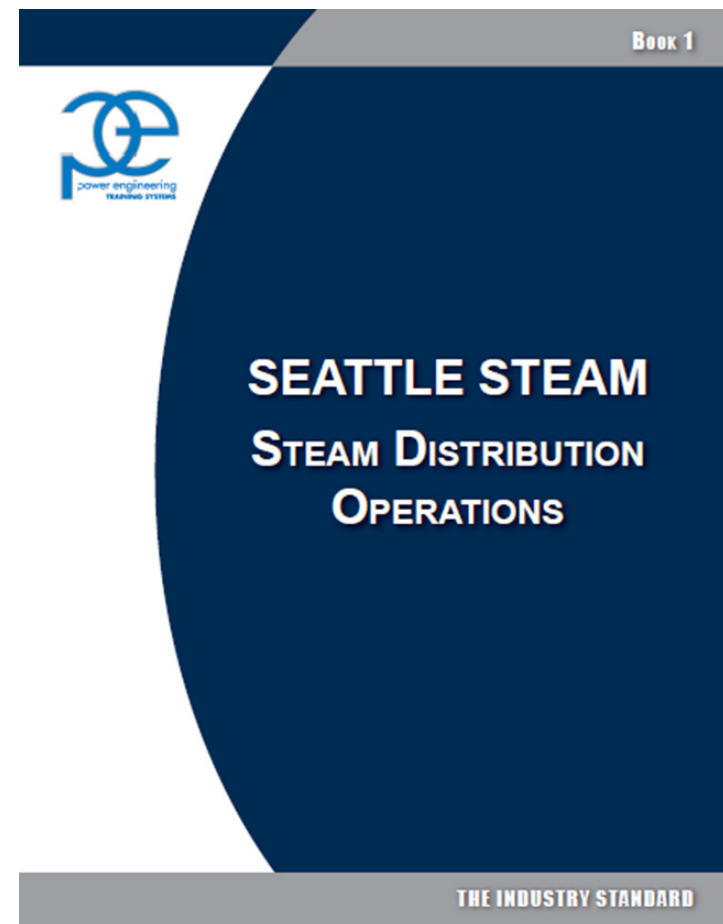
- Branded products
- Content-area specific
 - Turbines
 - Water treatment
 - Boiler operation
- Available in Print
- Available in eBook
 - Purchase
 - Subscription



PanGlobal's Offerings: Custom Accreditation Support

Corporate Custom Power Engineering Products

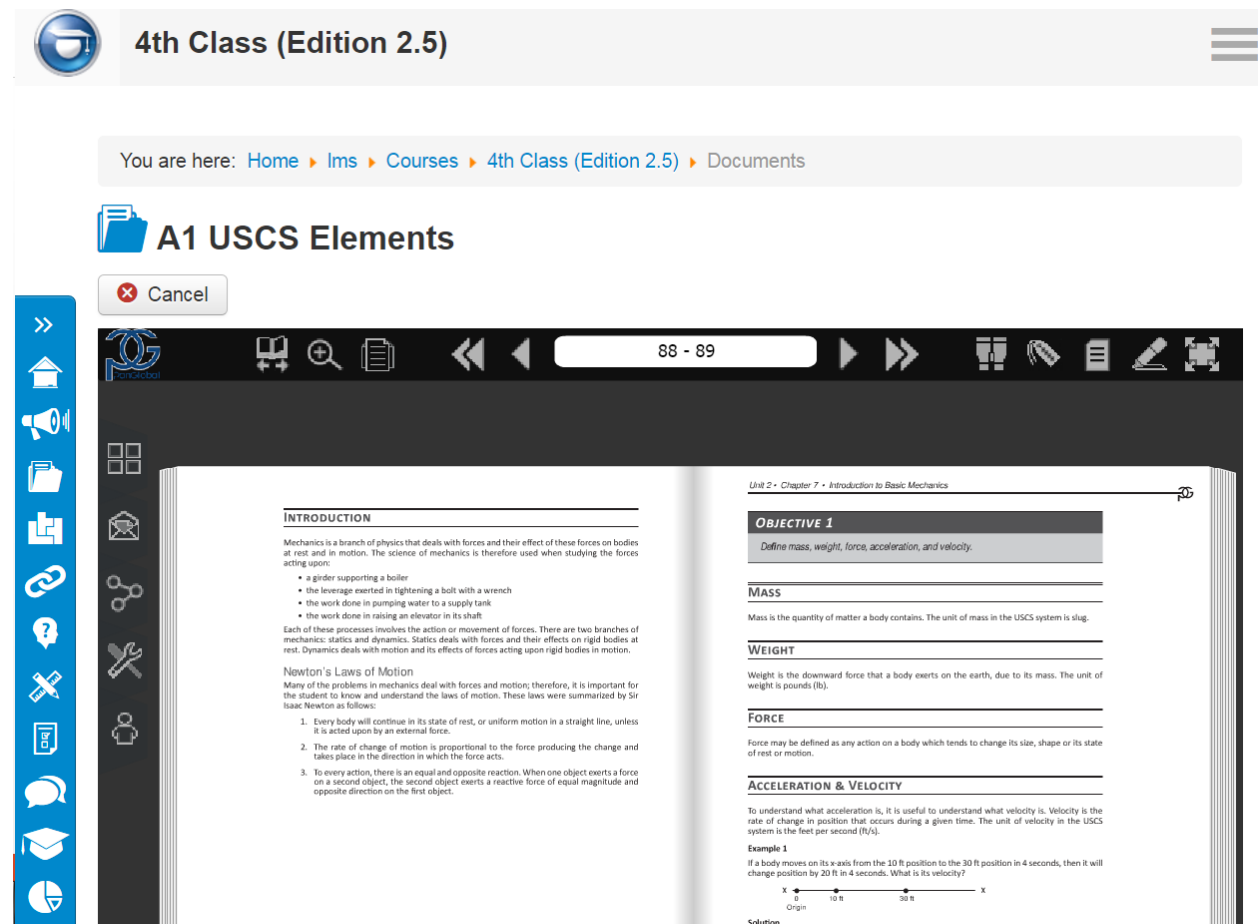
- Branded products
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 - Purchase
 - Subscription



PanGlobal's Learning Management Systems

Joomla LMS:

- MyPower Study LMS
- Designed for individual learners



The screenshot displays a Joomla LMS interface. At the top, it shows the course title "4th Class (Edition 2.5)" and a breadcrumb trail: "You are here: Home > lms > Courses > 4th Class (Edition 2.5) > Documents". Below this, the document title "A1 USCS Elements" is visible. A vertical toolbar on the left contains various icons for navigation and document management. The main content area shows a document viewer with a physics textbook page. The page is titled "Unit 2 • Chapter 7 • Introduction to Basic Mechanics" and contains sections for "INTRODUCTION", "Newton's Laws of Motion", "OBJECTIVE 1", "MASS", "WEIGHT", "FORCE", and "ACCELERATION & VELOCITY". A navigation bar at the top of the document viewer shows page numbers "88 - 89".



PanGlobal's Learning Management Systems

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- MyPower Study LMS
- Designed for individual learners

You are here: [Home](#) ▶ [lms](#) ▶ [Global question pool](#) ▶ Global Question Pool

Question X of 0
Point value 0

✓ OK

(4-066-3.8) During the "Rinse" stage when regenerating a sodium zeolite softener, the solution going to the sewer contains:

- Calcium sulphate
- Sulphates and bicarbonates
- Calcium and magnesium ions
- Sodium bicarbonates and sulphates
- Magnesium bicarbonate



PanGlobal's Learning Management Systems

moodle LMS:

- MyPower Learning LMS
- Designed for Institutional and Corporate learners

PanGlobal Training Systems Ltd. You are not logged in. (Log in)



NAVIGATION

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 ▶ Courses

COURSE CATEGORIES

- Educator Online Licenses
- Non-Educator Online Licenses
- Textbook Access
- Product Purchases
- Additional Resources
- Updates with Corrections

All courses ...

MyPower Learning

Welcome to the MyPower Home Page

CALENDAR

September 2016

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	



Workbook Answers/Solutions



Having Problems?



Content Updates with Correction



Submit a Ticket



Additional FAQs

Always keep your **user profile** current. This will ensure that your learning provider is able to contact you with up-to-date learning materials and events.



Announcing the PG eBook Store!

- Purchase or Subscription Options
- US (NIULPE) eBooks coming soon!
- <http://www.pgknowledge.com/>

The screenshot displays the PG eBook Store website. At the top, there is a search bar with the text "Search for title in catalog" and a "Go" button. To the right of the search bar are links for "Support", "Catalog", and "Redeem", along with a "Login" button and a shopping cart icon with a "0" notification. Below the search bar is a navigation menu with the following items: "Multi-level Learning Packs (1)", "First Class (9)", "Second Class (7)", "Third Class (5)", "Fourth Class (7)", and "Fifth Class (4)". The main content area features a featured product, "PE 4th, 3rd and 2nd Class eBook Set Collection", with a price of "C\$700.00 / 12 M" and an "Add to Cart" button. Below the featured product is a banner for "Power Engineering Class Textbook Set" with buttons for "Download on the App Store", "GET IT ON Google play", and "App Download Instructions". At the bottom, there is a carousel of five eBook sets: "PE 1st Class eBook Set", "PE 3rd Class eBook Set", "PE 2nd Class eBook Set", "PE 5th Class eBook Set", and "PE 4th Class eBook Set".



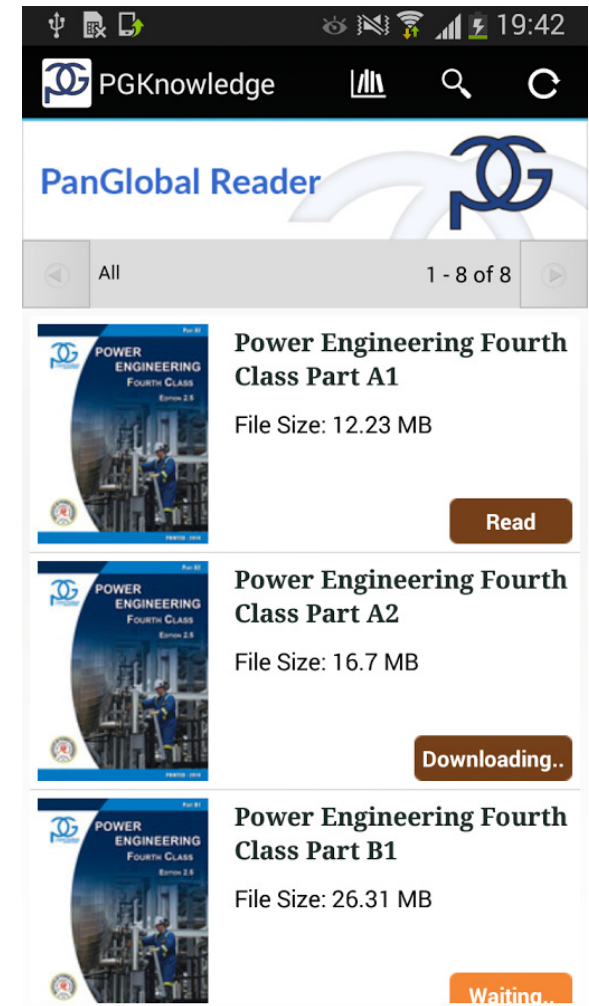
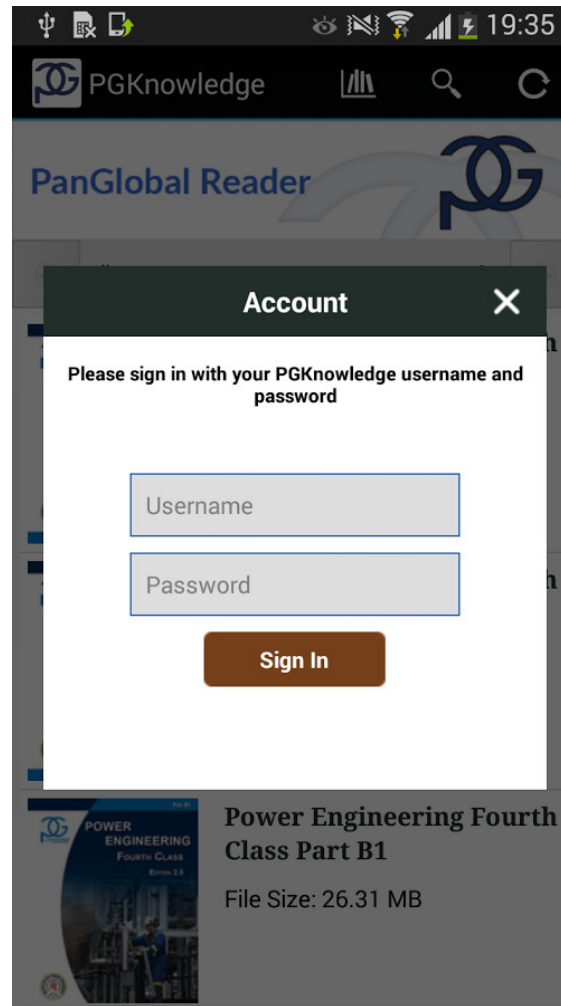
PanGlobal eBooks

- Full-text search engine to keep study topics connected
- Adapt automatically to your screen shape and size
- Personalize fonts and text size
- Add permanent notes, annotations and highlights
- Download eBooks for off-line use.
- Windows, Mac, iOS and Android (with the PG Mobile App)
- Individual Users
 - Both Standard Collections & Single volume sales
- Institutional Users
 - Instructors/Trainers can tailor custom compilations for the courses they teach.



The PG eBook Reader App

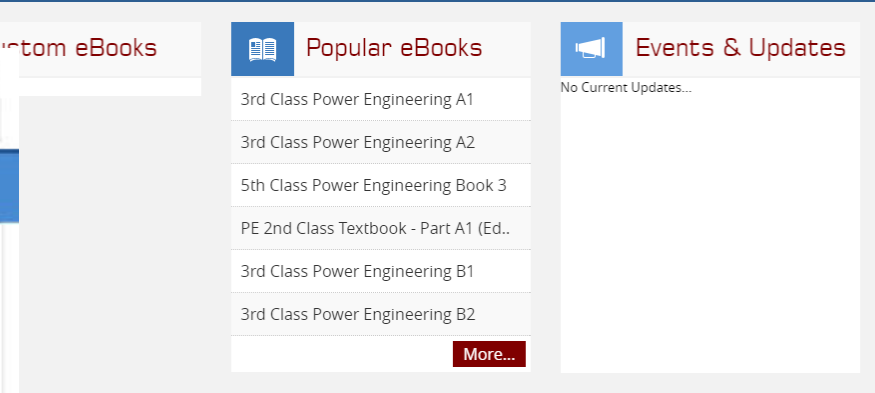
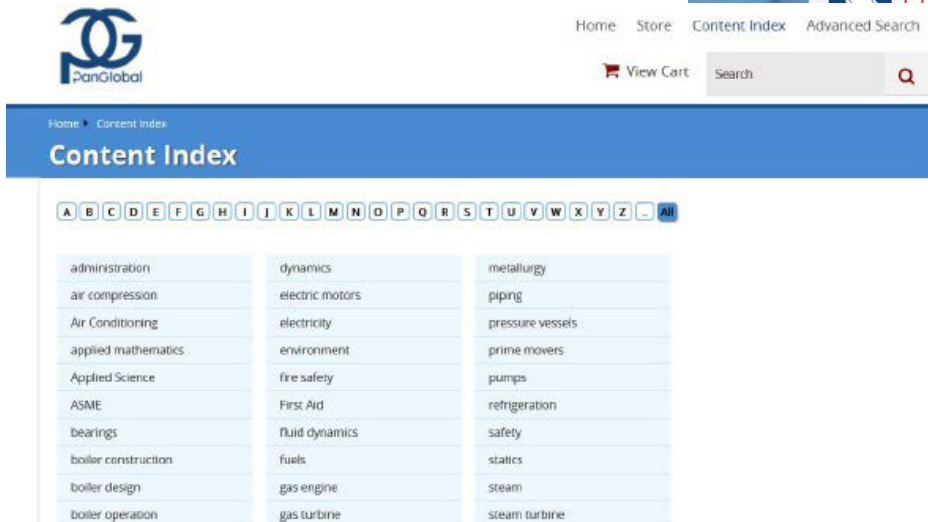
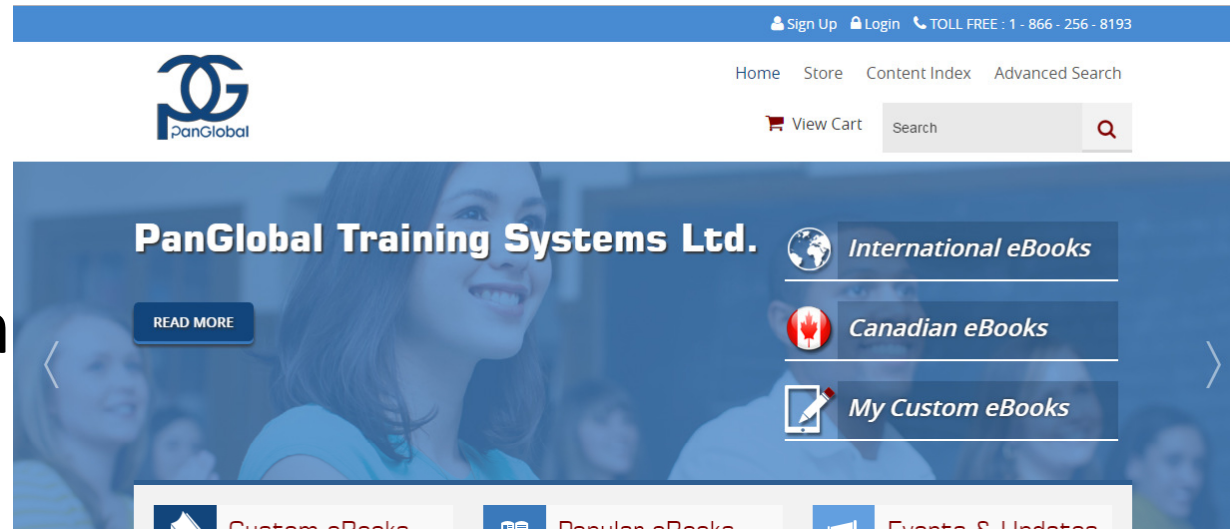
- iOS/Android tablets
- Smartphones
- US (NIULPE) eBooks coming soon!





Announcing the PG Knowledge Platform: A Resource Library for the Energy Sector

- Coming Soon!
- A Topic Based online reference portal for research and study





Announcing the PG Knowledge Platform: A Resource Library for the Energy Sector

- Subscription options
 - Individuals through your personal account
 - Standard Collections
 - Single volumes
 - Individual Chapters
 - Institutional and Corporate Users
 - Librarian can assign individual learning profiles within a subscribed Body of knowledge
 - Instructors/Trainers can identify a custom compilation for their courses.
 - Learners can purchase from a unique institutions/program bookshelf



Announcing the PG Knowledge Platform: A Resource Library for the Energy Sector

- Search across entire PG BOK to find the content you need
- Send your search to your personal bookshelf or a purchase option

The screenshot shows the 'Content Index' page of the PG Knowledge Platform. At the top left is the Pan Global logo. To the right are navigation links: Home, Store, Content Index, and Advanced Search. Below these is a 'View Cart' button and a search bar with a magnifying glass icon. The main heading is 'Content Index' with a breadcrumb trail 'Home > Content Index'. Below the heading is a horizontal navigation bar with letters A through Z and an 'All' button. The content is organized into three columns of links:

administration	dynamics	metallurgy
air compression	electric motors	pipng
Air Conditioning	electricity	pressure vessels
applied mathematics	environment	prime movers
Applied Science	fire safety	pumps
ASME	First Aid	refrigeration
bearings	fluid dynamics	safety
boiler construction	fuels	statics
boiler design	gas engine	steam
boiler operation	gas turbine	steam turbine



Announcing the PG Knowledge Platform: A Resource Library for the Energy Sector

- The entire PG body of knowledge can become a customized textbook
- A full-text search engine keeps study topics connected
- Subscriptions offer a lower price option tailored for the learner or institute
- Read the text in the font size of your choice
- Speeds up learner review of entire content area being studied
- Add notes, annotations and bookmarks
- Saves all edits and annotations



Wrap up: The Future of Operator Education

- **Certification and Risk Management**

- Jurisdictional focus:
 - NIULPE license
 - NAPE learning materials
- Corporate focus
 - NIULPE license
 - NAPE learning materials
 - PanGlobal Knowledge Platform
 - Corporate library
 - Content area focus, with vertical alignment
 - Supports activities of NIULPE and NAPE

- **Demographics**

- Boomers
 - Knowledge/experience transfer
 - Mentoring/Training
 - Lifelong Learners
- Millennials
 - Tech savvy
 - Multi-taskers
 - Justice
 - Sceptical
 - Sound andragogy
 - Variety



THANK YOU!



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