

# THE CHALLENGE OF TOO FEW JOBS FOR QUALIFIED NUCLEAR POWER GRADUATES: A TEXAS RESPONSE

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# Alligator resting near cooling pond at STP

(STP nuclear plant in the background)



## Introducing Mr. Rudolph Henry

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Rudolph Henry (on the left side of laboratory panel) is the Director of the Wharton Nuclear Power Technology Programme as well as its lead instructor. He is shown here assisting students with their required laboratory exercises.



## Background Information

- ▶ In 2007, reports by the **U.S. Department of Labor** [1], the **Center for Energy Workforce Development** [2], and the **Nuclear Energy Institute** [3] assessed the workforce challenges in America's energy industry. The DOL report discussed the energy industry's needs for new workers to be recruited and trained with new skill sets in the coming 10 years. It also noted that the average energy industry worker in the USA was over 50 years of age and that approximately 50% of them were planning to retire within 5 to 10 years. That meant that there would be a need to replace approximately 500,000 energy employees nationwide.
- ▶ The NEI workforce report noted that Texas would need three new nuclear power plant maintenance training programmes and at least one new non-licensed operator training programme. At the time of the NEI study, Texas had only five generic nuclear training programmes and one radiation protection programme. Based solely on estimates of retirements and normal attrition, NEI recommended that two of the existing generic programmes be restructured to comply with the Institute of Nuclear Power Operations' *Uniform Curriculum Guide* (ACAD 08-006) [4] for maintenance staff and that another programme be restructured for training operators.

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1. U.S. Department of Labour, "Identifying and Addressing Challenges in America's Energy Industry," USDOL, Washington DC, 2007.
  2. Center for Energy Workforce Development, "Gaps in the Energy Workforce Pipeline: A 2007 Workforce Survey Report," CEWD, Washington DC, 2007.
  3. Nuclear Energy Institute, "2007 Workforce Pipeline Survey," NEI, Washington DC, 2007.
  4. Institute of Nuclear Power Operations, "Uniform Curriculum Guide for Nuclear Power Plant Technician, Maintenance, and Nonlicensed Operations Personnel Associate Degree Programmes," INPO, Atlanta GA, 2008 & 2011.

# Development of the Wharton & Brazosport Programs

Beginning 2007: Four community colleges in Texas were encouraged by local economic development boards, STP nuclear power plant managers, and faculty at Texas A&M University to develop or to expand their nuclear power technology training programmes.

Why: To meet the manpower needs of the nuclear power industry in Texas, which anticipated a need to replace 100s of technicians in the coming years due to retirements.

Degrees offered: Associate and Baccalaureate of Applied Science.

Basis of curriculum: *Uniform Curriculum Guide* (ACAD 08-006) for 2-year nuclear technician training programmes, as issued by the Institute of Nuclear Power Operations (INPO).

Note: Since Wharton County Junior College and Brazosport College had the largest number of enrollments in the new programmes, this report will focus primarily on developments at these two colleges.

### **This case study report identifies:**

- (1) the process used to establish nuclear technician training programmes
- (2) at community colleges in southeast Texas
- (3) through formation of a coalition of interested stakeholders
- (4) also, curriculum that was developed
- (5) also, state-of-the-art instructional equipment
- (6) and adaptations to fluctuations in the nuclear power tech job market

### **Major aspects of the process:**

- ▶ Formation of Mid-Coast Industry and Education Alliance that included representatives of local economic development boards, industry, colleges, and universities.
- ▶ Development of Texas Nuclear Power Technology Training Partnership as a coalition of interested stakeholders.
- ▶ Achievement of broad communitywide consensus concerning the desirability of nuclear training programs.
- ▶ Development of linkages between nuclear industry, economic development boards, university partners, colleges, local ISDs, and community organisations.

## Other issues needing attention:

- ▶ Development of curriculum consistent with Uniform Curriculum Guide of the Institute of Nuclear Power Operations (INPO)
- ▶ Obtaining financial support for the programmes
- ▶ Acquisition and use of state-of-the-art nuclear instructional equipment that included “hands-on” training of the students
- ▶ Recruitment of young men and women into the nuclear training programmes
- ▶ Achievement of racial and ethnic diversity in enrollments
- ▶ Job placements for graduates

# Where in Texas are these programmes?



# Center for Energy Development Bay City, Texas USA

(location of the Wharton Nuclear Power Technology Programme)



# Specialisations in the Texas Programmes

## Wharton Nuclear Programme

- ▶ Associate of Applied Science degree in Nuclear Power Technology, with specialisations in
  1. Non-Licensed Operator (NLO)
  2. Electrical Technician (+ Level 2 Certificate)
  3. Instrumentation & Controls Technician (+ Level 2 Certificate)
  4. Mechanical Technician (+ Level 2 Certificate)

## Brazosport Nuclear Programme

- ▶ Associate of Applied Science degree in Chemical Technology or Instrumentation Technology, each with a Nuclear Enhanced Skills Certificate option
- ▶ Bachelor of Science degree in Nuclear Power Plant Management

# Recognitions

**March 2011**—International Atomic Energy Agency (IAEA) recognised the Wharton programme as a “best practice” programme among two-year nuclear power technology training programmes worldwide.

**September 2012**—Rudolph Henry (programme director) was invited to present a report concerning the Wharton programme at a meeting of the IAEA in Vienna, Austria.

**December 2012**—Mr. Henry presented report on nuclear training programmes to members of U.S. Congress, Deputy Secretary of Energy, and Assistant Secretary for Nuclear Energy.

**December 2012**—Wharton representative presented report at the European Nuclear Conference in Manchester, United Kingdom. Sponsored by European Nuclear Society.

**December 2012**—Wharton representative invited to present report at special meeting of the faculty of Department of Electrical Engineering at Brno University of Technology, Czech Republic.

**November 2013**—Wharton representative was invited speaker at the NESTet 2013, held in Madrid, Spain. Sponsored by European Nuclear Society.

**February 2014**—Wharton representative was invited speaker at 2<sup>nd</sup> International Conference of the Czech Nuclear Education Network, held in Prague, Czech Republic. Conference was sponsored by the Czech Ministry of Education and the European Union Social Fund for the Czech Republic.

**January 2015**—Wharton and Brazosport programmes were awarded the Sir J. C. Bose Memorial Award in a ceremony held in Bangalore, India. The programmes were deemed to be “a model for training nuclear power technologists in India.”

## A Quick Look at Results

- ▶ Because anticipated job openings in nuclear (as projected in the 2007 reports) have not yet materialised, you will see that enrollments in the Wharton and Brazosport programmes have declined significantly...from a peak of 140 students in 2009-10 to just 45 students in 2014-15. However, enrollments increased to 70 students in Fall 2015, due to the Wharton programme offering Level 2 Certificates in the Electrical, Mechanical, and Instrumentation and Controls specialties.
- ▶ We are hoping that the pace of retirements at the STP nuclear plant picks up during the next 3 to 5 years, and we are hoping that enrollments will increase as more nuclear jobs become available.
- ▶ Additionally, the Wharton programme has received U.S. State Department approval to begin admitting students from overseas into its nuclear power tech programme.
- ▶ The following table presents data on enrollments, demographics, graduations, and job placements.

## Combined Results for Wharton & Brazosport Programmes

### Enrollments, Graduations, and Job Placements

|                                               | 2007<br>-08 | 2008<br>-09 | 2009<br>-10 | 2010<br>-11 | 2011<br>-12 | 2012<br>-13 | 2013<br>-14 | 2014<br>-15 | 2015<br>-16 |
|-----------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <b>Enrollments</b>                            |             |             |             |             |             |             |             |             |             |
| Total students                                | 13          | 72          | 140         | 116         | 109         | 87          | 57          | 45          | 70          |
| <b>Gender</b>                                 |             |             |             |             |             |             |             |             |             |
| Male                                          | 11          | 58          | 117         | 93          | 90          | 70          | 49          | 32          | 57          |
| Female                                        | 2           | 14          | 23          | 23          | 19          | 17          | 8           | 13          | 13          |
| <b>Race/Ethnicity</b>                         |             |             |             |             |             |             |             |             |             |
| White non-Hispanic                            | 10          | 46          | 92          | 75          | 68          | 57          | 34          | 22          | 34          |
| Hispanic                                      | 3           | 19          | 29          | 32          | 31          | 22          | 15          | 15          | 28          |
| Black non-Hispanic                            | --          | 1           | 5           | 8           | 8           | 8           | 6           | 6           | 7           |
| Other                                         | --          | 6           | 14          | 1           | 2           | --          | 2           | 2           | 1           |
| <b>Graduates of the Programs</b>              |             |             |             |             |             |             |             |             |             |
| Associate Degree                              | --          | 5           | 43          | 22          | 32          | 33          | 17          | 11          | n/a         |
| <b>Status post-Graduation (partial count)</b> |             |             |             |             |             |             |             |             |             |
| Nuclear                                       | --          | 5           | 32          | 10          | 9           | 6           | 7           | 7           | n/a         |
| Non-Nuclear                                   | --          | --          | 2           | 13          | 30          | 24          | 9           | 1           | n/a         |

# Literature Review for this Case Study

- ▶ According to IAEA, *a partnership among different stakeholders is very conducive to the development of sustainable nuclear technology training programmes* [IAEA, *Status and Trends in Nuclear Education*. No.NG-T-6.1. March 2011].
- ▶ **Meredith Minkler** – University of California/Berkeley. Lead author: *Community Organising and Community Building for Health and Welfare* (Princeton, NJ: Rutgers University Press, 2012).
- ▶ **Frances Butterfoss** – Eastern Virginia Medical School. Lead author: *Coalitions and Partnerships in Community Health* (San Francisco, CA: Josey-Bass, 2007).
- ▶ Butterfoss (2007) developed definitions of collaboration, identified the intensity of collaboration, provided models of collaboration, and provided explanations of the types of coalitions.
- ▶ The effort in Texas to establish nuclear power technology training programmes at community colleges has the characteristics of a community-based partnership or coalition of stakeholders.

## Literature Review (continued)

The various types of coalitions include the following:

- ▶ **Grassroots coalitions:** to pressure policy makers.
- ▶ **Professional (agency-based) coalitions:** formed in times of crisis or as a long-term approach to increase influence.
- ▶ **Community-based coalitions of professional and grassroots members:** to influence more long-term health and welfare practices for a community. *This type could also be used to exert long-term influence regarding a particular issue or issues of importance to a community or region.*
- ▶ **Organisation-set coalitions:** formed to provide resources or services under an umbrella organisation.
- ▶ **Network coalitions:** formed by subgroups of organisations to provide services to a particular population or to advocate for a specific cause.
- ▶ **Action-set coalitions:** issue-specific and can be more or less formal, depending on the purpose of the coalition.

## Nuclear Power Technology Educational Coalition Members

Formation of an active, collaborative coalition of stakeholders resulted in consensus concerning nuclear power technology training programmes in southeast Texas.

- ▶ Community College Partners: Brazosport College, Wharton County Junior College, Victoria College (withdrew 2012), and Texas State Technical College
- ▶ University Partners: Texas A&M University through Texas Engineering Experiment Station and Nuclear Power Institute (Dr. Kenneth Peddicord); initial interest also from University of Texas/Austin through Mechanical Engineering Department (Dr. Sheldon Landsberger)
- ▶ Industry Partners: South Texas Project Nuclear Operating Company (STP), Exelon Nuclear Texas Holdings (withdrew 2012), and Nuclear Energy Institute (Washington DC)
- ▶ State of Texas Partners: Texas Governor's Office of Economic Development, Texas Workforce Commission, and Jobs/Education for Texans Programme

## Coalition Members (continued)

- ▶ Economic Development Partners: Wharton, Bay City, Brazoria County, & Victoria Economic Development Corporations
- ▶ Business Association Partners: Wharton, Bay City, Brazosport Area, Waco, & Victoria Chambers of Commerce
- ▶ School District Partners: Wharton, Bay City, Brazosport, Calhoun, El Campo, Victoria, & Waco Independent School Districts
- ▶ Community Partners: Boys and Girls Clubs, Golden Crescent Workforce Development Board, Christian Women's Job Corps, and Victoria Business and Education Coalition

# Guidance from Nuclear Power Institute Texas A&M University

- ▶ The Nuclear Power Institute (NPI), directed by Dr. Kenneth Peddicord, played a major role in providing guidance to the Wharton and Brazosport programmes and in advocating for them at national & international meetings.
- ▶ NPI arranged for Rudolph Henry, the Director of the Wharton Nuclear Power Technology Programme, to participate in the IAEA General Conference held in Vienna in September 2012.
- ▶ In December 2012, NPI arranged for Mr. Henry to make presentations in Washington DC concerning nuclear power training programmes to members of the U.S. Congress, Congressional staff members, the Deputy Secretary of Energy, and the Assistant Secretary for Nuclear Energy.
- ▶ NPI is currently structuring new training programmes that could bring students from nuclear “newcomer” countries to the Wharton programme to be trained in nuclear power technology. Graduates would then work at nuclear power plants or continue studies at NPI. WCJC has received State Department authorisation to admit foreign students.

# Funding for Texas Nuclear Training Programmes

Financial support from multiple sources since 2007:

- ▶ Bay City Community Development Corp., **\$4,500,000** – for purchase & renovation of a large facility to house nuclear power technology & other programmes (2008-09)
- ▶ Bay City Community Development Corp., **\$193,500** – for instructional equipment for nuclear & process technology programmes (2011)
- ▶ Residents of Bay City, Texas, **\$1,500,000** – for instructional equipment for nuclear & process technology programmes (2008-15)
- ▶ U.S. Department of Labor, **\$1,888,000** – for nuclear instructional equipment & initial operations at the partner colleges in Southeast Texas (2009-11)

## Funding (continued)

- ▶ Texas A&M University & Texas Workforce Commission, **\$280,000** – for start-up operations at the Wharton programme (2009-11, partially ARRA funding)
- ▶ U.S. Nuclear Regulatory Commission, **\$355,800** – for nuclear technology curricula development and faculty development at the Wharton programme (2012-14)
- ▶ U.S. Nuclear Regulatory Commission, **\$1,200,000** – for scholarships for students in nuclear technology programmes at the Wharton & Brazosport programmes (2009-14)
- ▶ State of Texas (Jobs & Education for Texans Office), **\$350,000** – for instructional equipment for nuclear & process technology programmes at the Wharton programme (2011) (see ribbon cutting)
- ▶ U.S. Department of Education (“earmark”), **\$220,000** – for instructional equipment for the Wharton programme (2011)

## Benefits of the Department of Labor Grant

- ▶ **Instructor Training**: Faculty members received an average of 120 hours of training provided by the coalition's industry partner (i.e., South Texas Project NOC), under the supervision of nuclear subject matter experts.
- ▶ **Curriculum Development**: The colleges worked with South Texas Project administrators to develop & modify curricula in compliance with the *Uniform Curriculum Guide* (ACAD 08-06).
- ▶ **Laboratory Development**: Significant upgrades were made to laboratory facilities & instructional equipment, including state-of-the-art nuclear instructional equipment, workstations, simulators, & "hands-on" training skids (i.e., HOT skids).
- ▶ **Purpose**: to ensure that students are trained to operate the same type of technology found in power generation facilities.

# HOT Skid Ribbon Cutting, June 2011

(purchased with funds from State of Texas JET Programme)



Left to right: Anthony Hawkins, Bay City Councilman & Member/BCCDC; Leigh Ann Collins, VP/Instruction/WCJC; Douglas Kubala, Chairman/PTech Advisory Committee; Willie Myles, Director/PTech; Wayne Stephens, Instructor/PTech; Betty McCrohan, President/WCJC; Rudolph Henry, Director/NPT; David Dunham, Campus Director; Clarence Fenner, President/BCCDC & Representative/STPNOC; and Stephanie Dees, Dean/Vocational Ed./WCJC

## **HOT Skid Ribbon Cutting, June 2011 (continued)**

- ▶ In June 2011, WCJC hosted a ribbon cutting ceremony at its Bay City Campus for its newly installed “hands-on” training skid (HOT Skid).
- ▶ Skid provides state-of-the-art training for students enrolled in Process Technology and Nuclear Power Technology programmes. Skid includes power generation equipment (i.e., gas-fired boiler, steam turbine, and electricity generator).
- ▶ Skid was funded by grants from the Jobs and Education for Texans Programme (JET Programme) and the Matagorda County Education and Training Fund.

# Specialisations at the Wharton Programme

Associate of Applied Science degree (2-year programme)

- ▶ Year 1: Power plant fundamentals courses in accordance with the *Uniform Curriculum Guide* (ACAD 08-006) of INPO
- ▶ Year 2: Discipline-specific courses

Specialisations:

1. Non-licensed Operator
2. Electrical Technician
3. Instrumentation & Controls Technician
4. Mechanical Technician

| <b>Power Plant Fundamentals</b>        |                                                            |                              |
|----------------------------------------|------------------------------------------------------------|------------------------------|
| <b>Academic Year 1 – Fall Semester</b> |                                                            |                              |
| <b>Course</b>                          | <b>Course Title</b>                                        | <b>Semester Credit Hours</b> |
| <b>NUCP 1371</b>                       | Math & Chemistry Fundamentals for Nuclear Power            | 3                            |
| <b>ENGL 1301</b>                       | Composition and Rhetoric I                                 | 3                            |
| <b>ENER 1350<br/>or<br/>PTAC 1302</b>  | Overview of Energy Industry<br>or<br>Intro to Process Tech | 3                            |
| <b>MATH 1314<br/>or<br/>MATH 2312</b>  | College Algebra<br>or<br>Pre-Calculus                      | 3                            |
| <b>Total</b>                           |                                                            | 12                           |

| <b>Power Plant Fundamentals (continued)</b> |                                              |                              |
|---------------------------------------------|----------------------------------------------|------------------------------|
| <b>Academic Year 1 – Spring Semester</b>    |                                              |                              |
| <b>Course</b>                               | <b>Course Title</b>                          | <b>Semester Credit Hours</b> |
| <b>NUCP 1370</b>                            | Nuclear Fundamentals I                       | 3                            |
| <b>NUCP 1373</b>                            | Nuclear Fundamentals II                      | 4                            |
| <b>PTAC 1432</b>                            | Process Instrumentation I                    | 4                            |
| <b>NUCP 1372</b>                            | Nuclear Power Plant Organisation & Processes | 4                            |
| <b>CHEM 1405<br/>or<br/>CHEM 1411</b>       | Introductory Chemistry<br>or<br>Chemistry I  | 4                            |
| <b>Total</b>                                |                                              | <b>19</b>                    |

| <b>Non-Licensed Operator Specialty</b><br>(to be completed following Power Plant Fundamentals) |                                    |                       |
|------------------------------------------------------------------------------------------------|------------------------------------|-----------------------|
| Academic Year 2 – Fall Semester                                                                |                                    |                       |
| Course                                                                                         | Course Title                       | Semester Credit Hours |
| <b>CETT 1409</b>                                                                               | DC-AC Circuits                     | 4                     |
| <b>NUCP 2470</b>                                                                               | Nuclear Power Plant Systems I      | 4                     |
| <b>PTAC 2314</b>                                                                               | Principles of Quality              | 3                     |
| <b>INTC 1350</b>                                                                               | Digital Measurement & Controls     | 4                     |
| <b>TBA</b>                                                                                     | Social/Behavioral Science Elective | 3                     |
| <b>Total</b>                                                                                   |                                    | 18                    |

| <b>Non-Licensed Operator Specialty (continued)</b> |                                           |                              |
|----------------------------------------------------|-------------------------------------------|------------------------------|
| <b>Academic Year 2 – Spring Semester</b>           |                                           |                              |
| <b>Course</b>                                      | <b>Course Title</b>                       | <b>Semester Credit Hours</b> |
| <b>NUCP 2471</b>                                   | Nuclear Power Plant Systems II            | 4                            |
| <b>SPCH 1315</b>                                   | Public Speaking                           | 3                            |
| <b>TBA</b>                                         | Humanities Elective                       | 3                            |
| <b>TBA</b>                                         | Discipline-related Elective               | 4                            |
| <b>NUCP 1480 (optional)</b>                        | Cooperative Education (Internship at STP) | 3                            |
| <b>Total</b>                                       |                                           | 14-17                        |

| <b>Electrical Technician Specialty</b><br>(to be completed following Power Plant Fundamentals) |                                                 |                       |
|------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------|
| Academic Year 2 – Fall Semester                                                                |                                                 |                       |
| Course                                                                                         | Course Title                                    | Semester Credit Hours |
| <b>CETT 1409</b>                                                                               | DC-AC Circuits                                  | 4                     |
| <b>INTC 1350</b>                                                                               | Digital Measurement & Controls                  | 4                     |
| <b>PTAC 2314</b>                                                                               | Principles of Quality                           | 3                     |
| <b>ELMT 2437</b>                                                                               | Electronic Troubleshooting, Service, and Repair | 4                     |
| <b>TBA</b>                                                                                     | Social/Behavioral Science Elective              | 3                     |
| <b>Total</b>                                                                                   |                                                 | 18                    |

## **Electrical Technician Specialty (continued)**

### **Academic Year 2 – Spring Semester**

| <b>Course</b>    | <b>Course Title</b>       | <b>Semester Credit Hours</b> |
|------------------|---------------------------|------------------------------|
| <b>INTC 1457</b> | AC/DC Motor Controls      | 4                            |
| <b>ELMT 2441</b> | Electromechanical Systems | 4                            |
| <b>SPCH 1315</b> | Public Speaking           | 3                            |
| <b>TBA</b>       | Humanities Elective       | 3                            |
| <b>Total</b>     |                           | 14                           |

## **Instrumentation and Controls Technician Specialty**

(to be completed following Power Plant Fundamentals)

### **Academic Year 2 – Fall Semester**

| <b>Course</b>    | <b>Course Title</b>                | <b>Semester Credit Hours</b> |
|------------------|------------------------------------|------------------------------|
| <b>CETT 1409</b> | DC-AC Circuits                     | 4                            |
| <b>INTC 1350</b> | Digital Measurement & Controls     | 4                            |
| <b>PTAC 2314</b> | Principles of Quality              | 3                            |
| <b>PTAC 2436</b> | Process Instrumentation II         | 4                            |
| <b>TBA</b>       | Social/Behavioral Science Elective | 3                            |
| <b>Total</b>     |                                    | 18                           |

**Instrumentation and Controls Technician Specialty (continued)****Academic Year 2 – Spring Semester**

| <b>Course</b>    | <b>Course Title</b>              | <b>Semester Credit Hours</b> |
|------------------|----------------------------------|------------------------------|
| <b>INTC 1457</b> | AC/DC Motor Controls             | 4                            |
| <b>ELMT 2452</b> | Power Generation Instrumentation | 4                            |
| <b>SPCH 1315</b> | Public Speaking                  | 3                            |
| <b>TBA</b>       | Humanities Elective              | 3                            |
| <b>Total</b>     |                                  | 14                           |

| <b>Mechanical Technician Specialty</b><br>(to be completed following Power Plant Fundamentals) |                                         |                       |
|------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------|
| Academic Year 2 – Fall Semester                                                                |                                         |                       |
| Course                                                                                         | Course Title                            | Semester Credit Hours |
| <b>CETT 1409</b>                                                                               | DC-AC Circuits                          | 4                     |
| <b>INMT 1305</b>                                                                               | Intro. to Industrial Maintenance        | 3                     |
| <b>INMT 2303</b>                                                                               | Pumps, Compressors, & Mechanical Drives | 3                     |
| <b>WLDG 1428</b>                                                                               | Intro. to Shielded Metal Arc Welding    | 4                     |
| <b>TBA</b>                                                                                     | Social/Behavioral Science Elective      | 3                     |
| <b>Total</b>                                                                                   |                                         | 17                    |

| <b>Mechanical Technician Specialty (continued)</b> |                                                                      |                              |
|----------------------------------------------------|----------------------------------------------------------------------|------------------------------|
| <b>Academic Year 2 – Spring Semester</b>           |                                                                      |                              |
| <b>Course</b>                                      | <b>Course Title</b>                                                  | <b>Semester Credit Hours</b> |
| <b>HYDR 1450</b>                                   | Hydraulics, Fabrication, & Repair                                    | 4                            |
| <b>MCHN 2403</b>                                   | Fundamentals of Computer Numerical Controlled (CNC) Machine Controls | 3                            |
| <b>SPCH 1315</b>                                   | Public Speaking                                                      | 3                            |
| <b>TBA</b>                                         | Humanities Elective                                                  | 3                            |
| <b>Total</b>                                       |                                                                      | 13                           |

## Manufacturing Technology (beginning Fall 2015)

- Wharton's new programme now offers certificates and eventually the AAS degree:
  - Time required for Level 2 Certificate: 1 year
  - Time required for AAS degree: 2 years
- Fields of specialisation:
  - ▶ Electrical Technician
  - ▶ Instrumentation & Controls Technician
  - ▶ Mechanical Technician
- Purpose: To maximise students' opportunities upon graduation for immediate employment in power generation, chemical processing, manufacturing, and other high demand industries in Texas.

# Specialisations at the Brasport Programme

Associate of Applied Science Degrees (2-year programmes)

- ▶ Chemical Technology (Process Operations), with Nuclear Enhanced Skills Option
- ▶ Instrumentation Technology, with Nuclear Instrumentation Option

All nuclear-related courses are in accordance with the *Uniform Curriculum Guide* (ACAD 08-006) of the Institute of Nuclear Power Operations (INPO).

## Brazosport Programme Specialisations (continued)

The following courses are required for the nuclear option in Chemical Technology and in Instrumentation Technology:

- ▶ NUCP 1370 – Nuclear Fundamentals I (3 credit hrs)
- ▶ NUCP 1371 – Math & Chemistry Fundamentals for Nuclear Power (3 credit hrs)
- ▶ NUCP 1471 – Nuclear Fundamentals II (4 credit hrs)
- ▶ NUCP 1472 – Nuclear Power Plant Organisation & Processes (4 credit hrs)
- ▶ NUCP 2470 – Nuclear Power Plant Systems I (4 credit hrs)
- ▶ NUCP 2471 – Nuclear Power Plant Systems II (4 credit hrs)
- ▶ INTC 1350 – Digital Measurement and Controls (3 credit hrs)

# Laboratory Facilities at the Wharton Programme

(similar facilities at the Brazosport Programme)

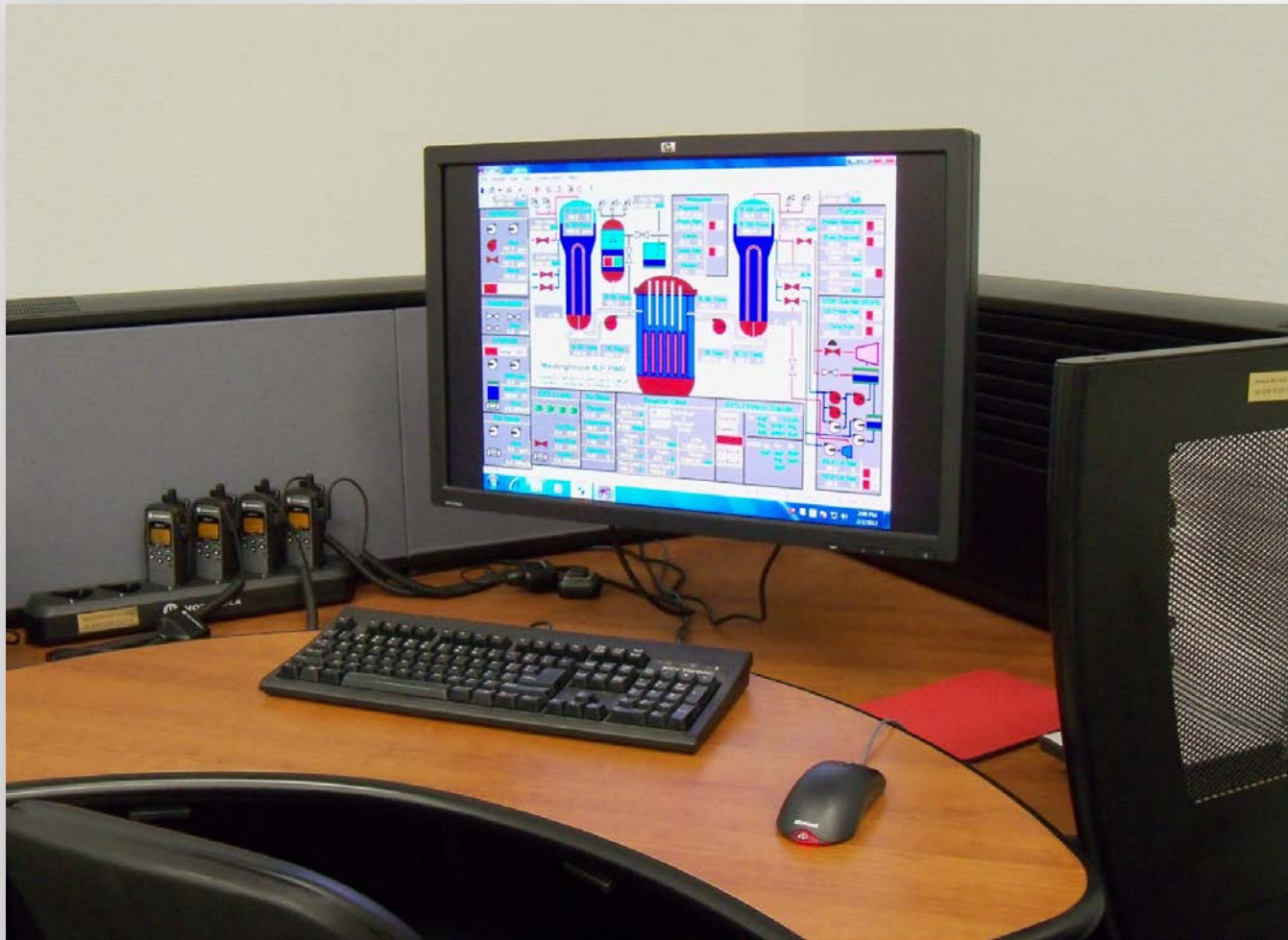
- The laboratory facilities are arranged in “learning cells”.
- Subject matter content in each learning cell serves as “hands-on” reinforcement for the *Uniform Curriculum Guide* (ACAD 08-006) requirements.

Learning cells include the following skills-based concentrations:

- 1) PC-based simulations (i.e., power plants, large motor controls, etc.)
- 2) Electrical/electronics testing, digital measurements, and controls
- 3) Power generation operations and maintenance (for both the Electrical and Instrumentation & Controls specialties)

## Operator Control Console

Purpose: for PC-based simulation monitoring and directing of individual student exercises



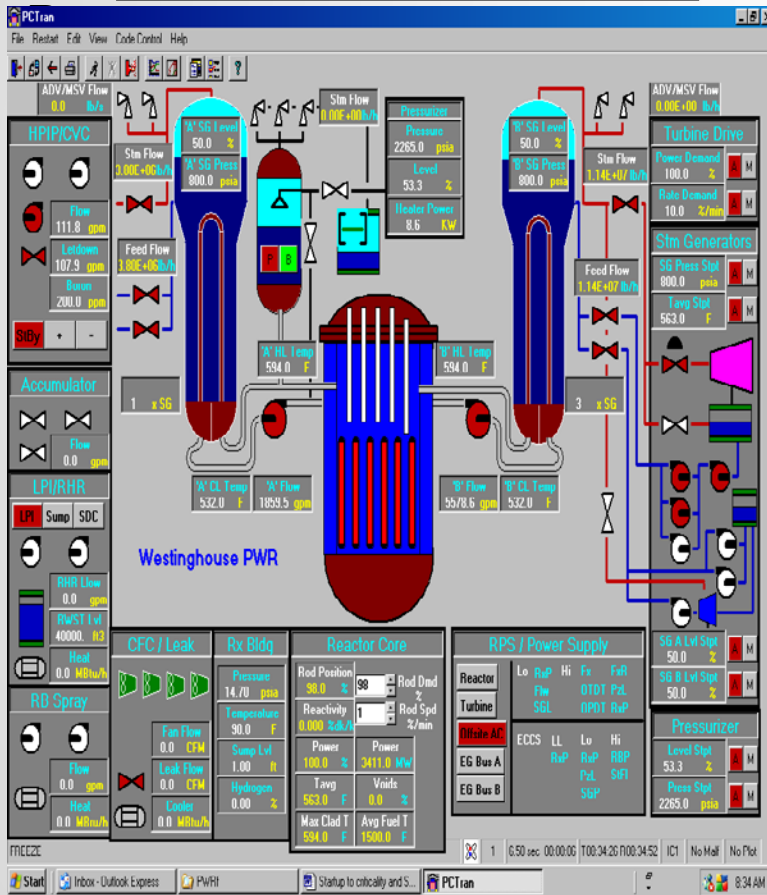
## Operator Control Console (another view)



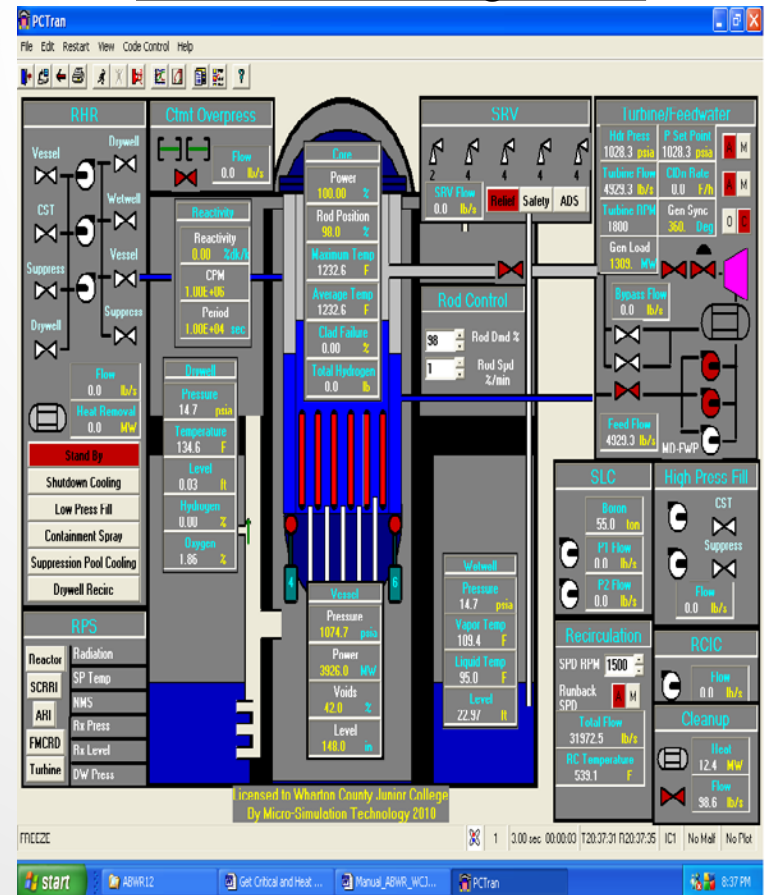
# Power Generation Simulators

## PCTran/MicroSimulation Technology

### Pressurised Water Reactor



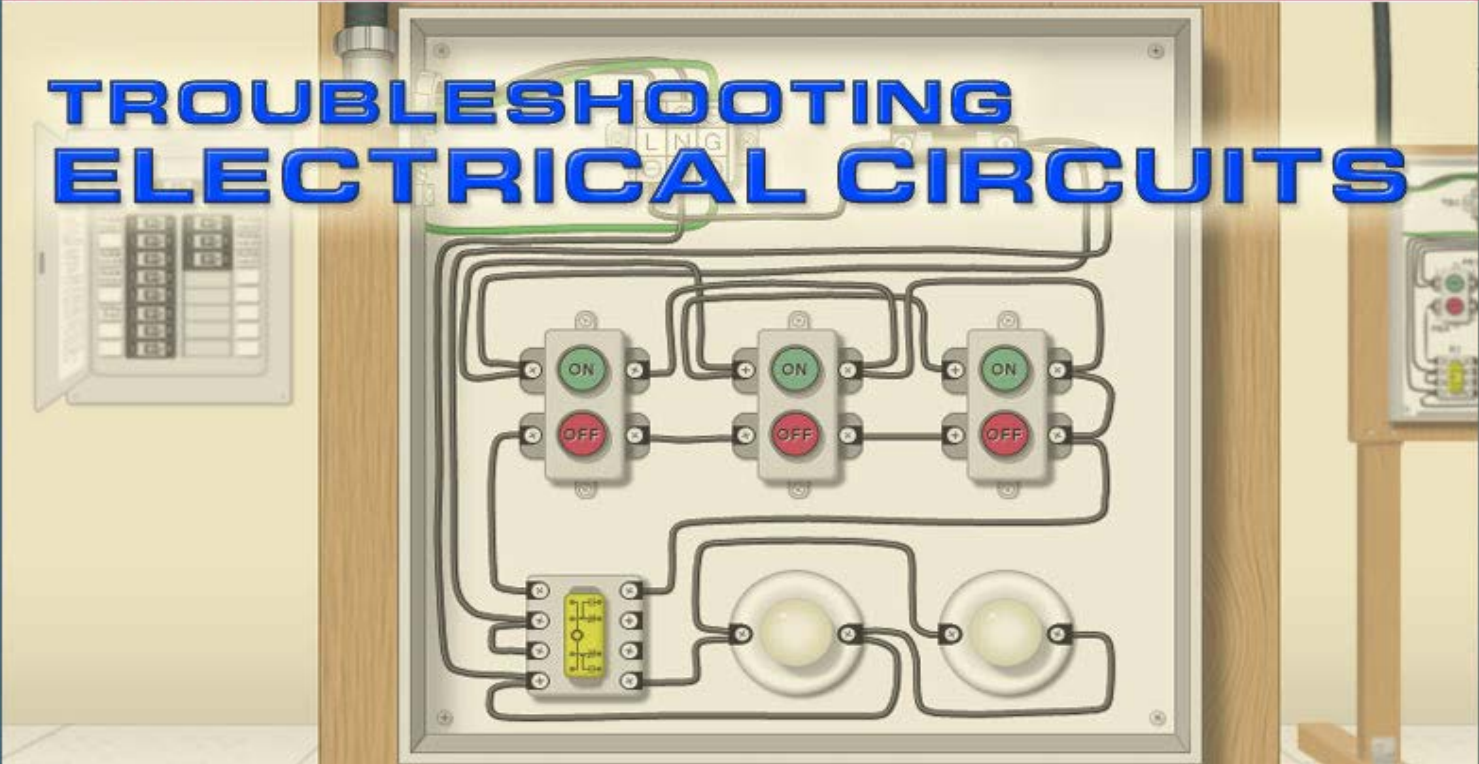
### Advanced Boiling Water



## Simutech's Troubleshooting Electrical Circuits Simulators

**Troubleshooting Skills Series V4**

# TROUBLESHOOTING ELECTRICAL CIRCUITS



The image shows a simulated electrical control panel. It features three single-pole switches arranged horizontally, each with a green 'ON' button and a red 'OFF' button. Below the switches is a fuse block with a yellow fuse. To the right of the fuse are two indicator lights. Wires connect the switches to the lights and the fuse. The panel is mounted on a wooden wall. In the background, other electrical components like a terminal block and a control unit are visible.

**Troubleshooting Skills** TRAINING SYSTEM

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## Simutech's Troubleshooting Control Circuits Simulators

**Troubleshooting Skills Series V4**

# TROUBLESHOOTING CONTROL CIRCUITS

**Troubleshooting Skills** TRAINING SYSTEM

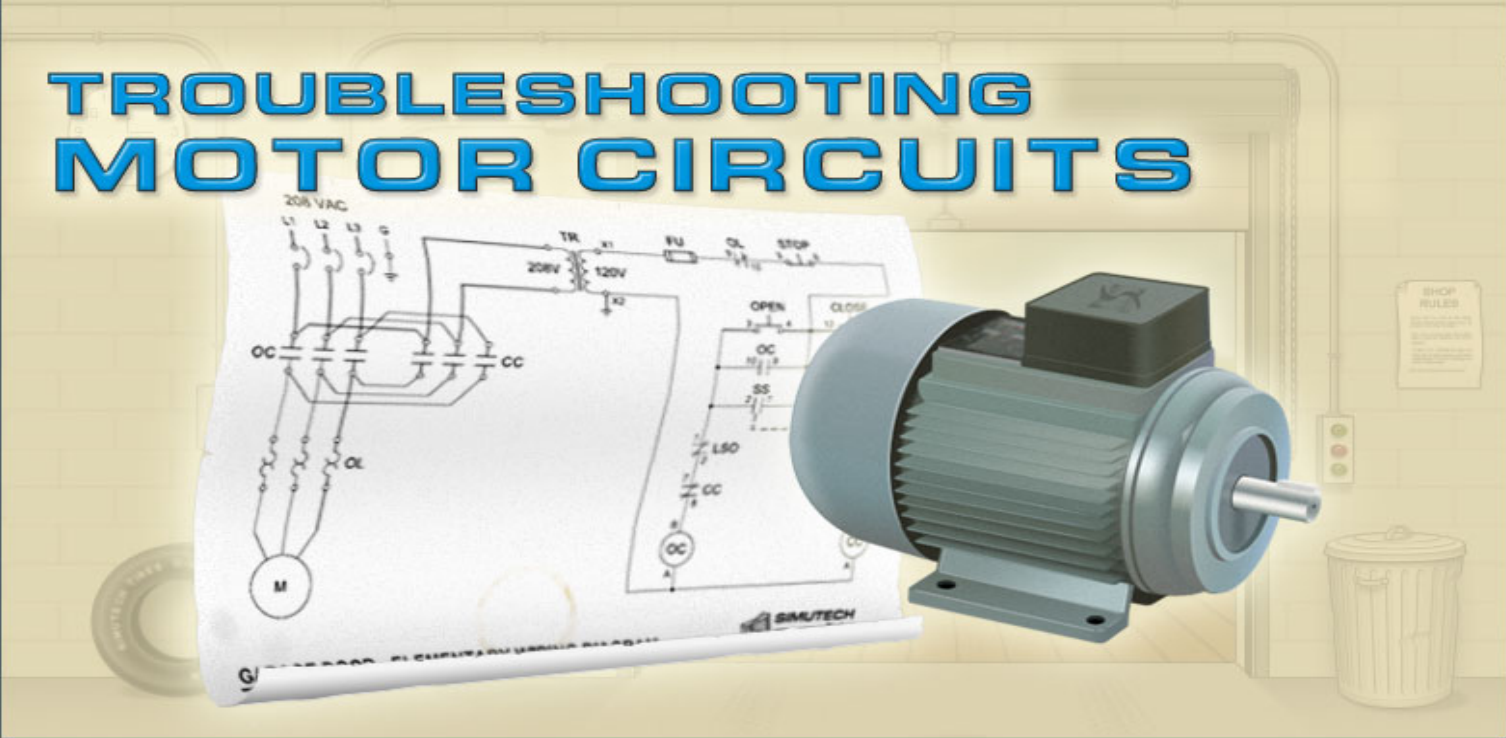
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# Simutech's Motor Circuits Troubleshooting Simulators

**Troubleshooting Skills Series V4**

## TROUBLESHOOTING MOTOR CIRCUITS



**Troubleshooting Skills** TRAINING SYSTEM

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## Simutech's Troubleshooting Industrial Controls Simulators



# Electrical and Instrumentation & Controls Specialisations

## Multi-Task Workstations

- ▶ Used in the power generation laboratory to accommodate the PC-based simulators.
- ▶ Include equipment, such as oscilloscopes, power supplies, and calibration instruments, among others.
- ▶ Workbench laboratory exercises include soldering, basic circuit assembly, and testing.
- ▶ All students in the operations and maintenance specialties are required to use Multi-Task Workstations to master elements of the *Uniform Curriculum Guide* that pertain to their specialty.

## Multi-Task Workstations

Comprised of PC stations, soldering stations, wire stripping, test equipment, power supplies, and other resources



# Turbine Technologies Replicated Steam Boiler/Turbine Generator

Purposes:

- 1) to train students to operate a small power plant
- 2) to demonstrate importance of following plant operational procedures
- 3) to demonstrate importance of monitoring data acquisition and analysis of flows, temperatures, and pressures
- 4) to demonstrate basic laws of thermodynamics as related to power generation

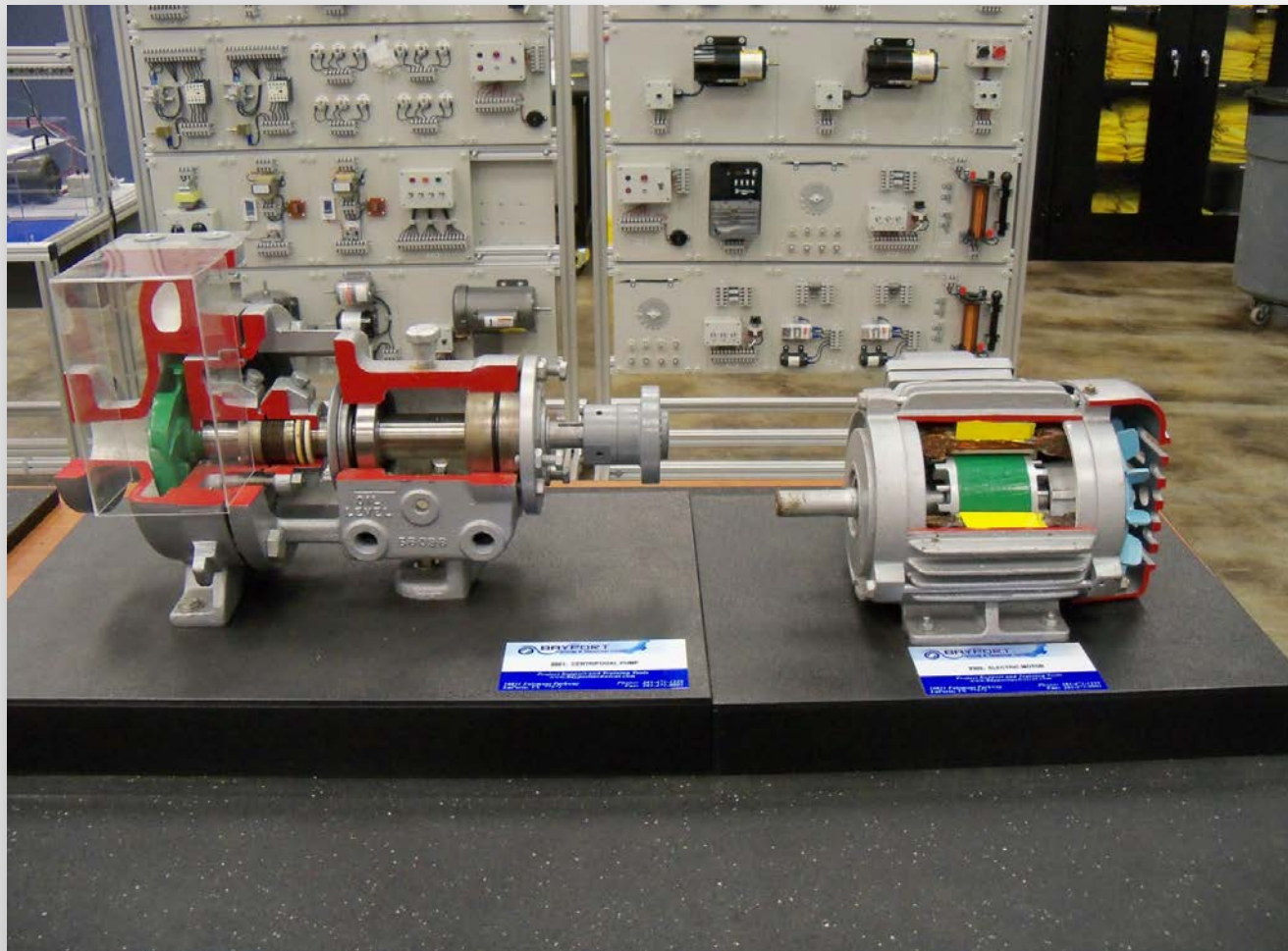


## First-year students generating power for the first time

Purpose: to give students “hands-on” understanding of the basics of steam power generation by using instructional equipment, such as a replica steam boiler-turbine-generator power generation plant



## Centrifugal Pump and AC Motor Models



## Protective Clothing

Purpose: to give students practice donning and doffing of protective clothing



## Portable Radiation Monitors



## Samples of Foreign Material Exclusion Tools (FME Tools)

Purpose: to reinforce classroom lectures on FME



## Identifying Fire-Retardant Wood (samples)



# Lubrication Training Unit

Purposes:

- 1) to teach students the principles of lubrication
- 2) to demonstrate the flooded, slinger ring, and bushing oil ring lubrication methods



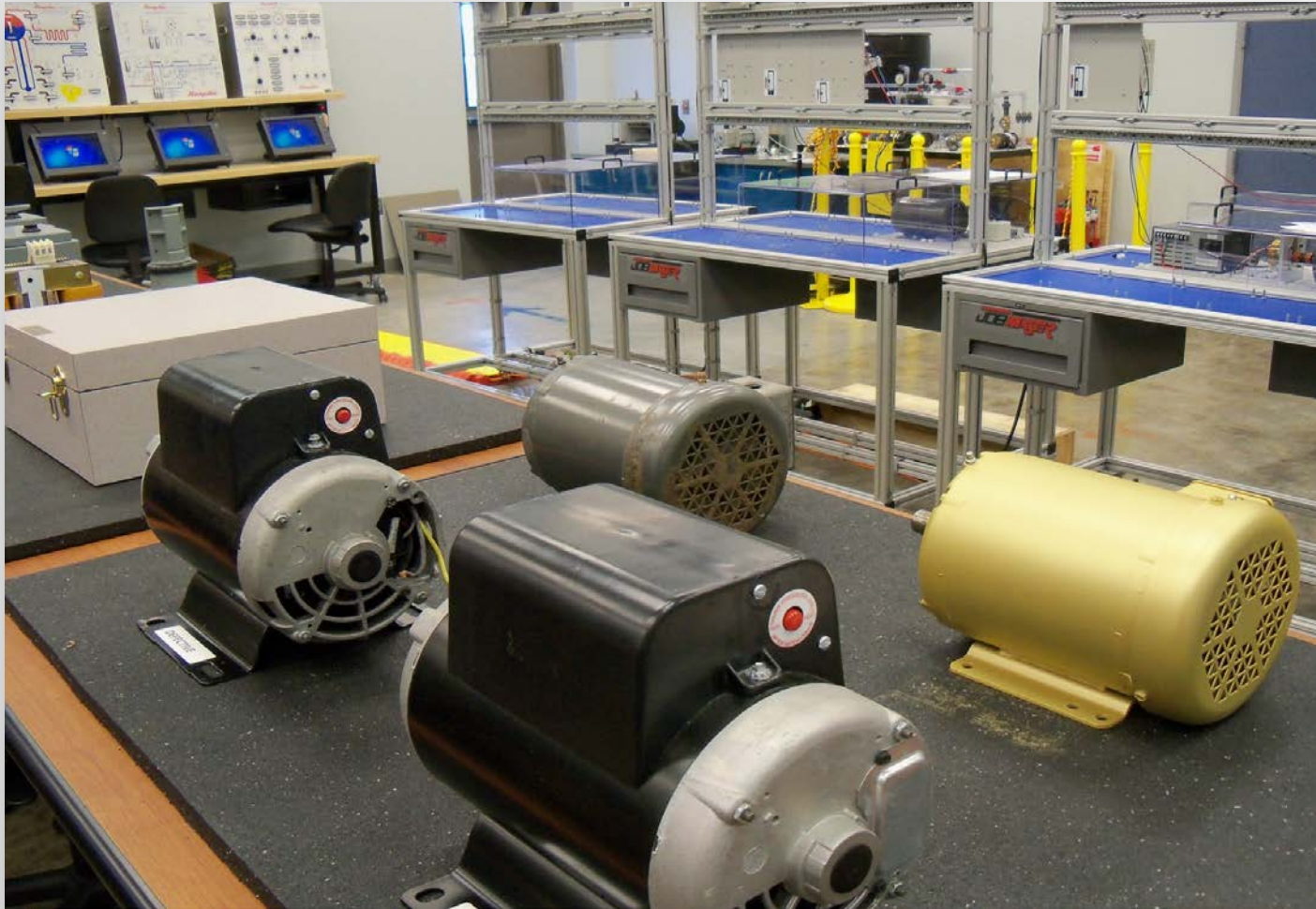
# Three-Phase Combination Motor Starters

Purposes:

- 1) to give students “hands-on” training
- 2) to teach them how to disassemble the starters for coil, contact, and overload element replacement and repair
- 3) to make the transition from the classroom lecture motor start/stop schematic to the actual real world standard wired-motor starter



## Single-phase and Three-phase Motor Workbench



## Motor Operated Valves

Purpose: to give students “hands-on” training using MOV trainers

Note: South Texas Project Nuclear Operating Company (industry partner) reported that there are more than 600 motor-operated valves used in its nuclear power generating facility.



# Slings and Shackles

Purpose: to reinforce lectures on rigging



# Electrical Tools and Hand-held Electrical Testing Instruments

Purpose: to allow students to perform electrical wiring, circuit testing, phase rotation, vibration analysis, and other functions



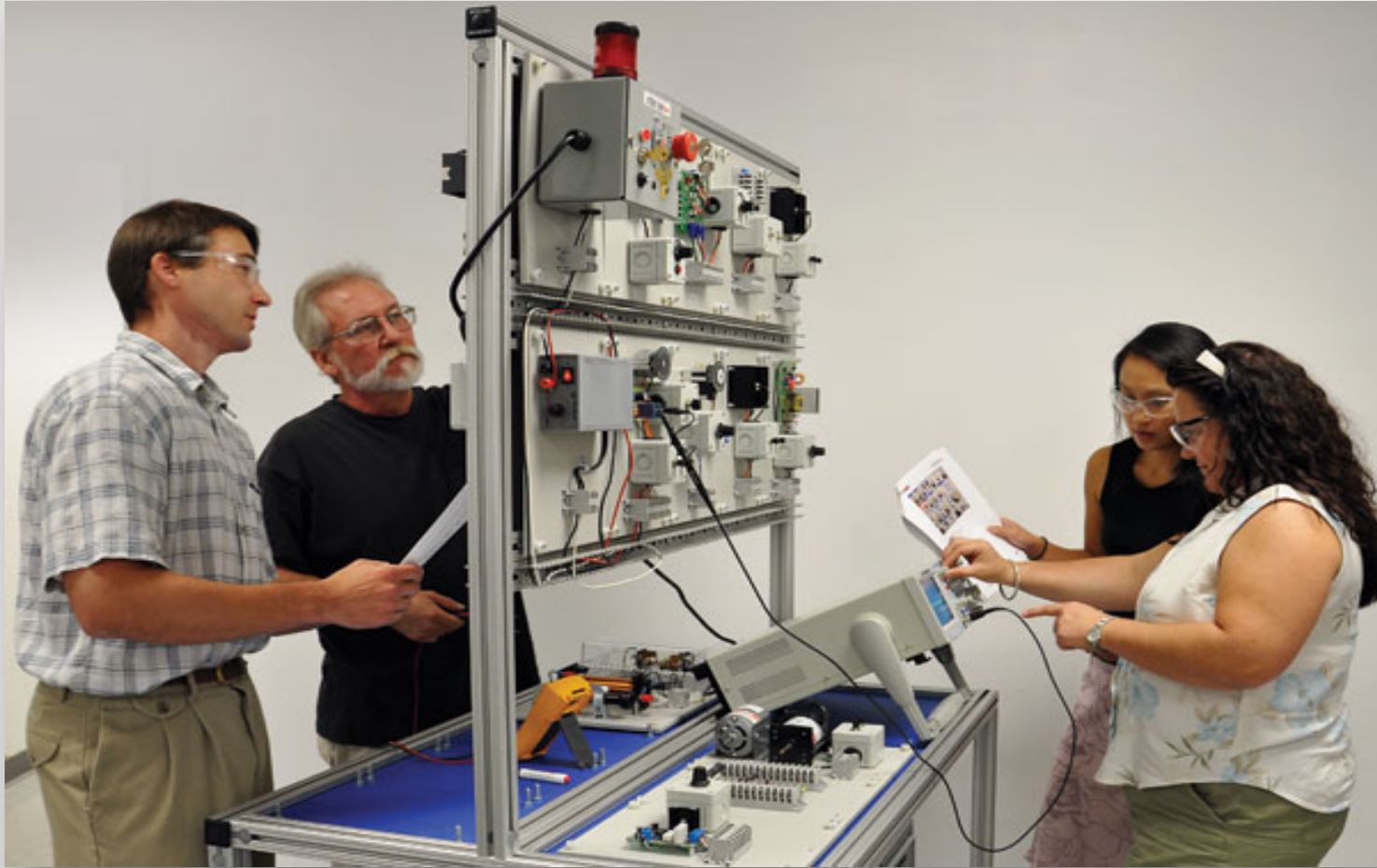
# Three-Phase Transformer and a Transformer Kit

Purpose: to allow students to perform “hands-on” exercises to learn principles of transformer operation and core and coil windings



# JobMaster™ Industrial Maintenance & Mechatronics Training Stations

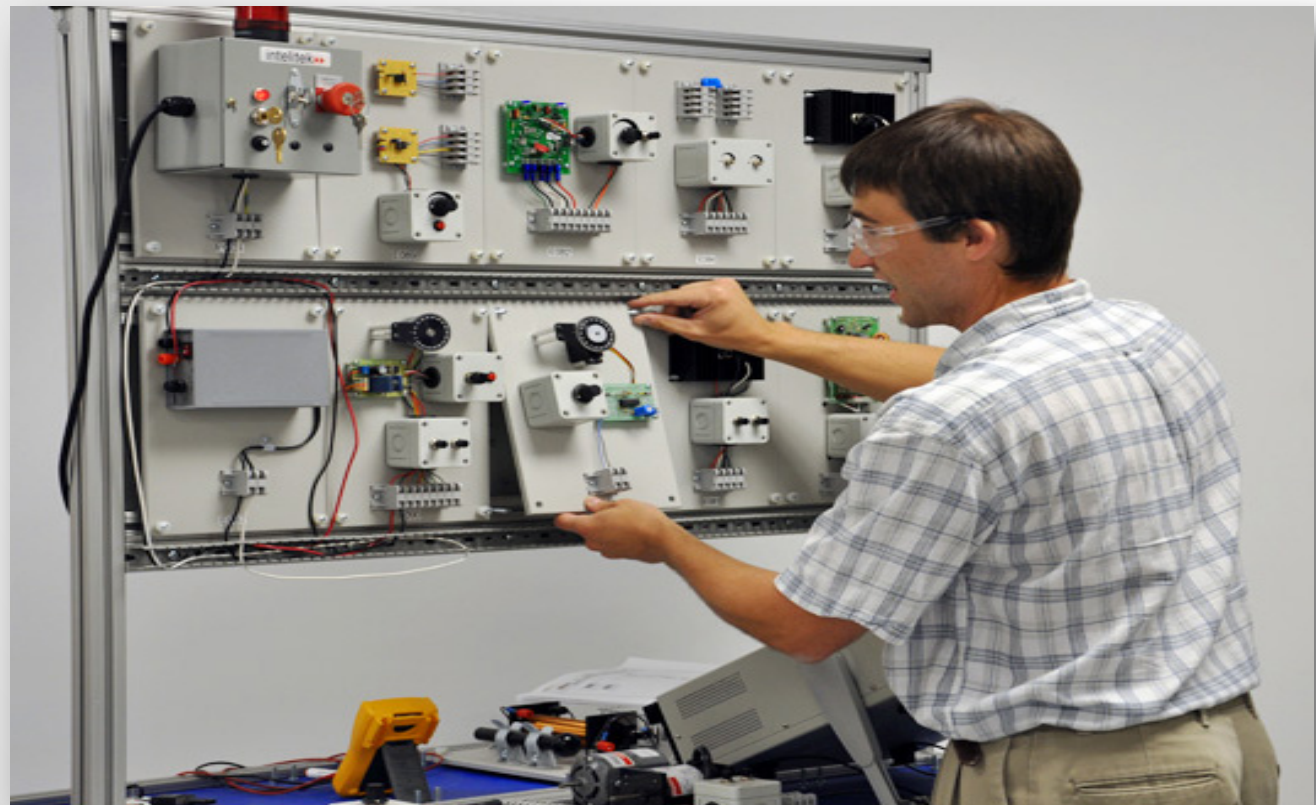
Purpose: for training exercises in the Electrical and Instrumentation & Controls specialisations



## JobMaster™ Panels

### Features:

- 1) facilitates laboratory exercises
- 2) has easily interchangeable panels
- 3) allows multiple courses to be taught simultaneously on the Learning Stations



## JobMaster™ Industrial Maintenance and Mechatronics Learning Stations with Modular Storage Racks

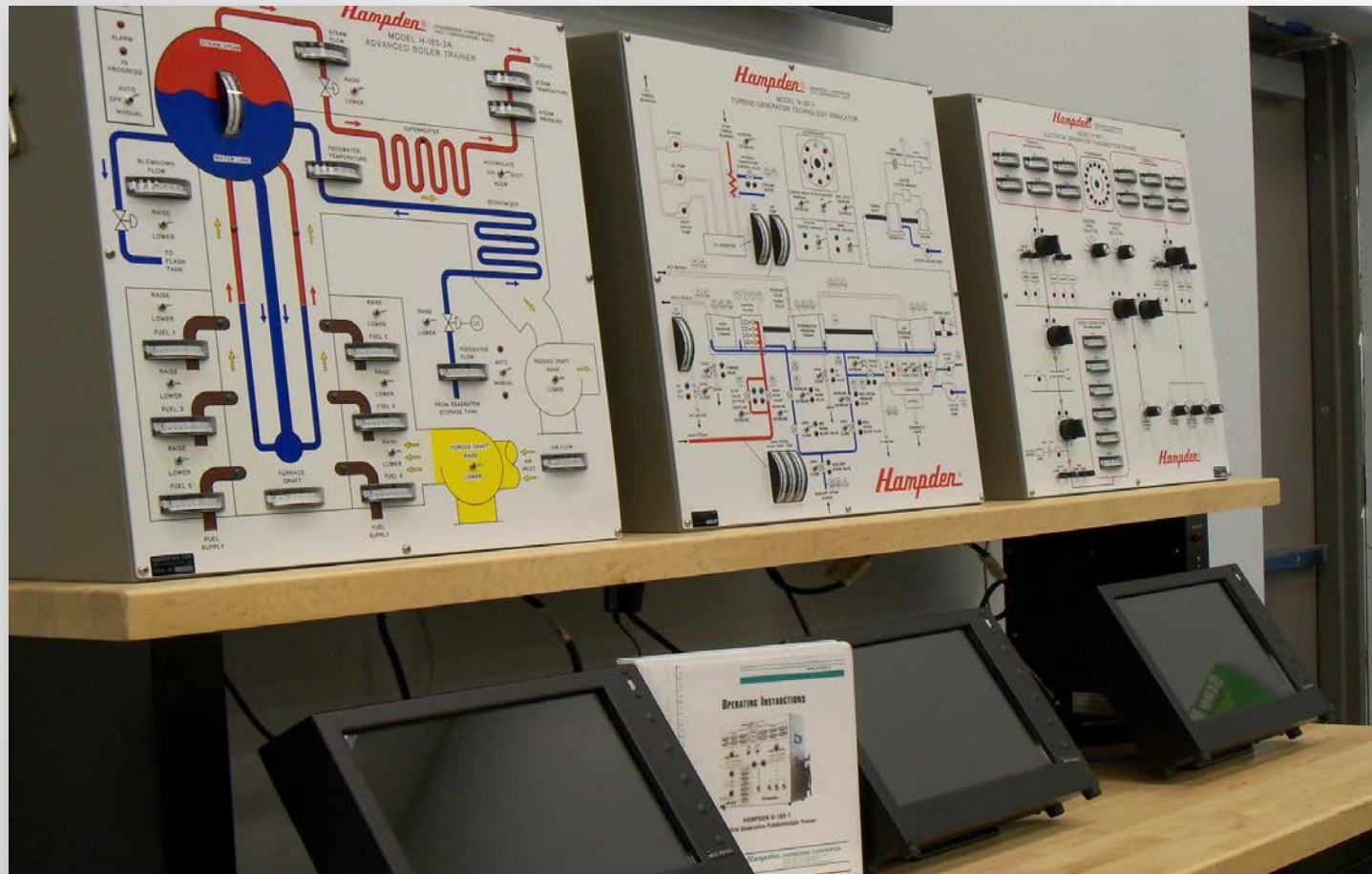


## Outcomes of the JobMaster™ Training System

Through this type of training, students gain practical experience in all aspects of industrial motor control, including:

- ▶ testing and resetting overload protection
- ▶ operating three-phase reversing starters
- ▶ trouble-shooting three-phase motor control circuits

# Advanced Boiler Turbine Generator and Electrical Distribution Simulation Training Skid



## Power Generation Portion of the Hands-On Training (H.O.T.) Skid

Purpose: to give students advanced “hands-on” training on an industrial-rated power generation system. (*Shown from right-to-left are the boiler, turbine generator, and the turbine generator control cubicle.*)



## Student Projects / Required for Classes

Students are required to prepare and present projects in their classes. Here, a student presents his project in NUCP 1472 – Nuclear Power Plant Organisation and Processes.



## Things to remember about the instructional equipment:

1. State-of-the-art instructional equipment and simulators were acquired by the Wharton and Brazosport programmes to enable our faculty to meet the objectives of ACAD 08-006 (INPO).
2. Use of industry-related simulators in teaching nuclear power technology courses results in highly qualified graduates, who are readily employable at a nuclear plant (when there are job openings).
3. Our curriculum requires all students to take the same courses in Year 1 and then to specialise in Year 2 in a discipline specialisation of their own choosing, such as non-license operator, electrical technician, I&C technician, or mechanical technician.
4. Use of this type of equipment and simulators allows students to receive industry-related training that results in their earning the transferable National Academy of Nuclear Training Certificate (NANT Certificate).

*Thank you for your interest in the Texas programmes, and please contact us for additional information. We would be happy to assist you.*

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