

## Florida Industrial and Phosphate Research Institute (FIPR Institute) Annual Report FY 2020- 2021

Florida Industrial and Phosphate Research Institute

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Cover Photo: The pilot plant installation of the Packed Column Jig research achieved separation of phosphate rock and dolomite in initial testing during the Fiscal Year 2020-2021.

## FIPR Institute Fiscal Year 2020-2021 Overview

#### **Executive Summary**

During Fiscal Year 2020-2021, the Florida Industrial and Phosphate Research (FIPR) Institute achieved significant research milestones. Significant accomplishments include: the separation of dolomite from phosphate rock from an over 5% concentration to ~1.25% concentration in the processed ore stream with the Packed Column Jig (PCJ), receiving Federal funding for two rare earth element research projects (Critical Materials Institute - \$230,000 and Advanced Processing of Rare Earth Elements - \$150,000), and significant progress on a demonstration project that uses phosphogypsum stack material, mixed with a proprietary additive, as a cost competitive and structurally superior alternative to lime rock as road base.

Looking forward into Fiscal Year 2021-2022, the FIPR Institute anticipates the completion of the Packed Column Jig project and looks forward to commercializing the resulting Intellectual Property (IP). The PCJ pilot plant equipment will be relocated to the FIPR Institute campus upon completion of the separation testing. The Federally funded rare earth element research projects will continue to seek cost effective sources of critical materials from phosphate materials. Smart Road construction and installation will be completed, and data collection will commence. Finally, the FIPR Institute will begin a more active collaboration with faculty at Florida Polytechnic University and will open 2 to 3 projects to be performed/managed by the faculty where these projects will be refined in consultation with Mosaic and the Florida Department of Environmental Protection.

The FIPR Institute was established by the Florida Legislature in 1978 as a state-funded entity focused on environmental and efficiency concerns of the phosphate industry. FIPR is empowered in this role to identify, develop, and promote technological solutions that benefit the environmental concerns of the state and the very real business concerns of the industry. Explicitly, the FIPR Institute is neither a "producer" or a "regulator." Historically, FIPR has executed this role with research efforts from a range of universities and specialized businesses. More recently, FIPR has been performing research and development internally. The FIPR Institute now includes:

- State-funded projects that support Florida business (the phosphate industry) and carefully consider the environmental concerns of the state,
- Laboratory capability that serves the specialized analysis needs of the phosphate industry,
- Competitive extramural funded research capacity focused on augmenting the FIPR mission with Federal and Industrial funding.

#### Background

The FIPR Institute was established with a statutory charge to address issues critical to the phosphate industry operations for the benefit of the citizens of Florida. Florida Statute **1004.346(4)(a)** Florida Industrial and Phosphate Research Institute specifies the following–

(4) INSTITUTE DUTIES AND AUTHORIZED ACTIVITIES.-

(a) The institute shall:

1. Establish methods for better and more efficient practices for phosphate mining and processing.

2. Conduct or contract for studies on the environmental and health effects of phosphate mining and reclamation.

3. Conduct or contract for studies of reclamation alternatives and technologies in phosphate mining and processing and wetlands reclamation.

4. Conduct or contract for studies of phosphatic clay and phosphogypsum disposal and utilization as a part of phosphate mining and processing.

5. Provide the public with access to the results of its activities and maintain a public library related to the institute's activities, which may contain special collections.

FIPR has identified four technical focus areas where it has technical capacity, or where it will build technical capacity, so that its research efforts are aligned with the statute, the needs of the industry, and the environmental needs of the state. These areas are:

- Minerals processing / rare earth elements (REE's) (based on 1004.346(4)(a)1 and 5),
- Phosphogypsum (PG) stacks and PG utilization (based on 1004.346(4)(a)1,3,4, and 5),
- Water, including process / industrial wastewater (based on 1004.346(4)(a)1 and 5),
- Phosphatic clay (based on 1004.346(4)(a)1, 4, and 5).



Four technical focus areas for FIPR Research and Development.

As a part of its mission, consistent with the mission of Florida Polytechnic University, FIPR will pursue the development of commercializable intellectual property. In addition, specialized Laboratory Services that are unique to, or useful for, the phosphate industry are an integral part of the FIPR Institute. These services are provided at appropriate commercial cost to the users. Laboratory Services provides the funding (in part) for FIPR's fully up-to-date set of analytical laboratory capabilities which are critical to the overall research mission.



Aaron Medley, Technical Project Manager, teaches Florida Polytechnic University students how to use the Lachat P<sub>2</sub>O<sub>5</sub> phosphate autoanalyzer in the FIPR Institute analytical chemistry laboratory.

The Florida Polytechnic University Board of Trustees authorized funding for a joint Environmental Engineering - FIPR Institute facility on the Florida Polytechnic Lakeland campus. Transitional plans are being implemented to seamlessly facilitate this move while minimizing impact on continuing critical Institute operations. The new facility will be built and occupied within the next two years. It will be located adjacent to the new Applied Research Center (ARC) on Florida Polytechnic University's main campus.

#### FIPR Institute's Strategic Mission

The FIPR Institute's mission was strategically designed to align with and compliment the mission of Florida Polytechnic University which is:

"Our mission at Florida Poly is to serve students and industry through excellence in education, discovery, and application of engineering and applied sciences."

The mission of the FIPR Institute is:

"The mission of the FIPR Institute is to maintain a leadership role in identifying, conducting, funding, disseminating, and assuring the scientific validity of research in the phosphate and related industries. The mission is implemented by conducting in-house research and funding research by others, subjecting the research to peer review, and disseminating the research results to other researchers and the public."

These associated missions, along with statutory priorities, are executed using the four research focus priorities of the FIPR Institute.

## **FIPR Institute Accomplishments**

For the Fiscal Year 2020-2021, the research-related accomplishments of the FIPR Institute are categorized as:

- Major Research Efforts (Packed Column Jig, Critical Materials Institute and Smart Road)
- Laboratory and Consulting Services
- Industrial Collaborations (Destack Consortium, Critical Materials Corporation)
- University Integration (FarmBot, Capstone Drone Project, Capstone CMC Water Clean-up Project)
- Grant Proposal Submissions (The "DOE REE" Project, CMI FY 2021-2022)

(Note: Individual project descriptions are found on pages 8 to 22 of this document.)

The research priority of "Minerals Processing/Rare Earth Elements" was addressed by the Packed Column Jig, Critical Materials Institute, CMI FY 2021-2022 and the "DOE REE" projects.

The research priority of "Phosphogypsum Stacks" was the focus of the Smart Road and Destack Consortium projects.

The research priority of "Water," including the topics of industrial wastewater and process water, was addressed through the work with Critical Materials Corporation directly, and their work with Florida Polytechnic University students via the Capstone CMC Water Clean-up Project. The recent hiring of Environmental Engineering professors at Florida Polytechnic University will facilitate more comprehensive water-related research projects in FY 2021-2022.

The research priority of "Phosphatic Clay" did not have direct effort within the FIPR Institute during the FY 2020-2021. As always, the Institute is aware of the issues regarding clay and clay ponds and is poised to move forward with research on this priority, should the opportunity present itself.

It should be noted that Laboratory and Consulting Services reached across all listed research priorities as it provides analytical and other services to the FIPR Institute and outside entities. Finally, FarmBot and the two Capstone Projects (Drone and CMC Water Clean-up) specifically address the FIPR Institute's continued integration with Florida Polytechnic University via direct student involvement.

#### Major Research Efforts

#### Packed Column Jig (PCJ)



# "The PCJ has achieved successful separation of dolomite and phosphate rock."

Dr. Patrick Zhang, Principal Investigator, PCJ research project

The Packed Column Jig (PCJ) is an innovative gravity separation device that the FIPR Institute is currently testing and improving in a pilot-plant scale installation located at Mosaic's South Pasture facility. Initially proven in bench-scale, the PCJ gravity-separation technology can remove dolomite from phosphate ore using only water and air and the jigging action of the device. Dolomite, a natural contaminant in Florida phosphate rock, causes numerous problems in phosphoric acid manufacturing and fertilizer production, such as reducing filtration capacity, consuming extra sulfuric acid, reducing  $P_2O_5$  recovery, lowering phosphoric acid quality, and upsetting granulation. The lower zone Hawthorne Formation (geologic stratum) being currently mined commonly has high MgO contamination.

There are existing techniques for dolomite removal from phosphate rock, including: flotation, chemical treatment, and high-temperature treatment. All these methods have some associated environmental issues and increased beneficiation operating costs. Removal of dolomite with the PCJ process will allow utilization of existing and identified deposits of ore that are currently too high in dolomite to process in a cost-effective manner.

Extensive lab testing and initial test runs of the PCJ pilot plant using high dolomite phosphate rock feed stock show successful separation. Concentrate of less than 1% MgO was achieved at over 85% P<sub>2</sub>O<sub>5</sub> recovery on a high-dolomite pebble sample containing more than 4% MgO. Success parameters are met when dolomite content in the product is lowered to 1% or less for chemical processing. Pilot plant testing runs continue under different size fractions of pebble, adjusting operational parameters to optimize results.

Initial Pilot Plant Scale PCJ Testing Results on One Size Fraction (2.36 x 1.4 mm) of a High-Dolomite Pebble (~2.60% MgO) Sample - Representative Composite Results (Source: FIPR Institute Analytical Laboratory).

| Sample ID   | %                             | %    |
|-------------|-------------------------------|------|
|             | P <sub>2</sub> O <sub>5</sub> | MgO  |
| Feed        | 23.98                         | 2.28 |
| Concentrate | 26.18                         | 0.91 |
| Tails       | 20.78                         | 2.87 |

The PCJ can be used for separation of any ore components that have different densities. The FIPR Institute continues to explore commercialization pathways for the PCJ technology. Testing completion is expected by the end of the second quarter in FY 2021-2022.



View from the top of the jig column; water pushes up and fine particles move out with the wash-over.

#### Critical Materials Institute (CMI)

As the United States and its allies try to secure supply of critical materials, particularly some of the critical rare earth elements (REEs), recovery of REEs from secondary resources is becoming a significant part of the overall supply strategy. Phosphate is perhaps the most significant secondary resource for REEs. FIPR Institute research shows that much of the United States' and even the worldwide demand for REEs could be met by recovery from phosphate mining and processing streams generated in the United States. Florida phosphate deposits contain substantial amounts of the most valuable critical elements, such as dysprosium (Dy), neodymium (Nd), praseodymium (Pr), samarium (Sm), and yttrium (Y).



CMI-related research was performed by FIPR Institute laboratory staff. Florida Polytechnic University students received observational learning experiences regarding the process of Federal grant work.

The FIPR Institute is a founding member of the Critical Materials Institute (CMI), an Energy Innovation Hub funded by the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Advanced Manufacturing Office. Since CMI's inception in July 2013, the FIPR Institute played a leading role in developing technologies for recovery of REEs from phosphate mining and processing products and byproducts, including phosphatic clay, flotation tailings, phosphoric acid, phosphogypsum, and phosphoric acid sludge. Technically feasible processing flowsheets have been developed for each stream. FIPR Institute's current focus is on REE recovery from phosphoric acid sludge, as this stream presents the best chance for economic production of REEs from phosphate processing.

Major REEs and Total REE Concentrations (ppm) in Four Phosphoric Acid Sludge Samples (Source: FIPR Institute Analytical Laboratory).

| Sample<br>date | Y      | La     | Ce     | Pr    | Nd     | Sm     | Eu    | Gd     | Dy     | Total<br>REE |
|----------------|--------|--------|--------|-------|--------|--------|-------|--------|--------|--------------|
| July 2016      | 538.21 | 529.97 | 751.75 | 66.78 | 529.47 | 70.15  | 30.87 | 161.56 | 110.84 | 2824.90      |
| June 2017      | 432.34 | 426.04 | 609.52 | 69.68 | 281.26 | 76.04  | 17.18 | 111.48 | 72.11  | 2147.22      |
| March<br>2018  | 842.29 | 552.60 | 713.96 | 94.48 | 368.58 | 110.52 | 30.50 | 188.16 | 159.01 | 3183.25      |
| Aug. 2019      | 498.24 | 466.59 | 633.65 | 84.89 | 337.63 | 91.03  | 24.62 | 141.91 | 98.78  | 2459.42      |
| Average        | 577.77 | 493.8  | 677.22 | 78.95 | 379.24 | 115.91 | 34.39 | 201.04 | 110.18 | 2653.69      |

Note: For simplicity, other REEs (approximately seven elements) with low concentrations are not listed in this table individually but included in the Total REE.

Under the CMI funded research, FIPR Institute has collaborated with prestigious national labs and universities, including Oak Ridge National Lab, Idaho National Lab, Lawrence Livermore National Lab, Rutgers University, Purdue, UC Davis, and Colorado School of Mines.



Current collaborating members of the Critical Materials Institute.

During the Fiscal Year 2020-2021, the CMI research work performed by the FIPR Institute brought in \$172,561.47 in grant funding. This year's research achieved 90% recovery of both P<sub>2</sub>O<sub>5</sub> and REEs via the current experimental processes. *(Update: For the eighth year the FIPR Institute has applied for and been granted continuing funding from CMI. The Fiscal Year 2021-2022 grant is for \$230,000 for continued research on REE extraction from phosphate processing streams.)* 

#### **Smart Road**



"The FIPR Institute is nearing completion of a research project to develop a novel road base mixture that has been shown in laboratory testing to have superior mechanical properties."

Gary Albarelli, Principal Investigator, Smart Road research project

One of the FIPR Institute's major priorities is to develop large-scale uses for the over 1 billion tons of phosphogypsum that have accumulated in stacks in Florida. This could result in enormous economic benefit, while also addressing the environmental and economic liability that these stacks pose.

The FIPR Institute is nearing completion of a research project to develop a novel road base mixture that has been shown in laboratory testing to have superior mechanical properties. The laboratory results below show comparative road base strengths as measured by the Florida Department of Transportation standard Limerock Bearing Ratio (LBR) test for a variety of mixes. A 50/50% mix of PG with traditional materials with varying amounts of the two-part additive (A) or Portland cement (PC) were tested. LBR values compare to standard value of LBR=100 for limerock. PG alone has an LBR value of 28. However, all but one of the cases tested with PG and an additive demonstrated a superior LBR value to limerock.

Although the mixes with Portland cement show higher LBR values, the relative cost when compared to much lower percentages of the two-part additive make these mixes cost prohibitive. Similarly, mixes using costlier limerock when compared to less expensive readily available local materials are less preferable. The preferable (most cost-effective) mix in Florida is 50/50% PG+clayey sand with 1% additive. An optimal mix may reduce road construction cost by up to 20-25% when compared to traditional road construction methods.

| MIX                  | % Additive | LBR<br>VALUE |
|----------------------|------------|--------------|
| PG + SAND            | 1.0 A      | 136          |
| PG + SAND            | 2.0 A      | 72           |
| PG + CLAYEY SAND *** | 1.0 A      | 138          |
| PG + CLAYEY SAND     | 2.0 A      | 155          |
| PG + LIMEROCK        | 1.0 A      | 184          |
| PG + LIMEROCK        | 2.0 A      | 162          |
| PG + SAND            | 5.0 PC     | 165          |
| PG + SAND            | 10.0 PC    | 290          |

Laboratory LBR Results for Material Mixes and Percent Additives (Source: Madrid CPWG).

\*\*\* This optimal mixture represents the most cost-effective for Florida.

A small section of the FIPR parking lot will be rebuilt as a first test of the efficacy of the proposed optimal mixture. The test will be installed in two parts: the first utilizing a road base of the optimal mixture as the experimental test, and the second utilizing the Florida conventional limerock road base as the control. Plans are evolving for the installation of identical instrumentation to compare performance of the test section when compared to the control. In addition, a well will be installed adjacent to each of the two sections. These wells will be instrumented for sulfate monitoring as an indicator for radionuclide migration from the road bases.

#### Laboratory and Consulting Services

The laboratories at the FIPR Institute support our own focused research and the phosphate-based research of others on a contractual basis by providing analytical results. The FIPR labs have developed specialized capability for tests associated with phosphate chemistry. This capability includes specific processes and analytical methods such as flotation, grinding, screening, particle size analysis, solvent extraction, thermal analysis, colorimetric testing, optical emission spectroscopy and mass spectroscopy. The combination of state-of-the-art instrumentation with a laboratory staff dedicated to providing impeccable quality standards has led to industrial recognition of the FIPR analytical lab as a leader in phosphate-related analyses.



50% = Phosphate Analysis Big 6 (P<sub>2</sub>O<sub>5</sub>, Insol, MgO, Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, CaO)
30% = Individual Metal Analysis (Cd, Co, Ni, Cu, Zn, Au, Ag, Li, Na)
10% = Rare Earth Elements + Th and U
5% = Water Analysis (P<sub>2</sub>O<sub>5</sub>, MgO, Al<sub>2</sub>O<sub>3</sub>, Fe<sub>2</sub>O<sub>3</sub>, CaO, SO<sub>4</sub>, F, TDS, pH, ORP, DO, Conductivity)
5% = Particle Size Analysis, Sample Preparation

Categorization of Laboratory Services Analyses (Source: FIPR Institute Analytical Laboratory).

In Fiscal Year 2020-2021, the FIPR Institute laboratories provided analytical services to thirteen (13) different entities in multiple work efforts for a total of \$101,405. Laboratory Services recorded a 30% increase in revenue from the last fiscal year.

The FIPR Institute sees water treatment and analysis as a promising growth area. The crisis at the Piney Point facility in Manatee County has led to engagement of organizations involved in its remediation and recognition of the necessity for the Institute to plan for rapid development of these capabilities. On the basis of these conversations, we are adding a discrete analyzer for specific water testing that will be used as part of our analytic services. In addition, the FIPR Institute has provided laboratory testing and technical consulting for a specific industrial location concerning PG water issues in the last year.

In the coming year, we will continue to expand laboratory capabilities by adding research-capable water and wastewater analysis capability. The development of a water treatment and analysis laboratory facility will also be a great asset to facilitate growth of Florida Polytechnic University's nascent Environmental Engineering program.

#### **Industrial Collaborations**

#### **Destack Consortium**

This year's events at Piney Point reminded all the stakeholders in the phosphate industry of the ongoing environmental challenge of the gypsum stacks. The regulatory recognized solution to phosphate mining waste in Florida is the required stacking of phosphogypsum along with its associated acidic process water. The "destack" consortium started with a set of local organizations that each can conceptually address a part of the technical challenges presented by the phosphogypsum stacks.



The initial Destack Consortium meeting was held on June 15, 2021 at the FIPR Institute.

The Destack Consortium recognizes that "stacking" is produced by the regulatory requirements currently in place and hopes to identify a set of technical and regulatory solutions that will allow the stacked material to be used in another manner (such as road base). The primary basis for the regulatory structure is radium content and its resultant radon emanation. Technologies promising to reduce radium content in the phosphogypsum itself or limit radon emanation from end products will be a primary focus. The group has agreed to continue meeting and verify possible technical solutions that were discussed during the initial meeting.

#### Critical Materials Corporation (CMC)

The establishment and solicitation of industrial partnerships with a need for a strategic footprint in the region have already been initiated, as exemplified by the relationship with Critical Materials Corporation (CMC) having its central Florida center of operations located on the FIPR Institute's Bartow campus. It is anticipated that this is the first of many such business arrangements to recognize the FIPR Institute's strategic position. In Fiscal Year 2020-2021, the agreement with CMC brought in \$24,015 and is tracked as research through the Florida Polytechnic University Office of Research Services.



The partnership between the FIPR Institute and Critical Materials Corporation (CMC) was celebrated with a formal signing ceremony.

Phase 2 of the CMC business partnership is currently being finalized. This next step expands the CMC and FIPR Institute relationship. An additional partnership with an environmental engineering firm is expected to be in place within the next fiscal year, utilizing the template of the CMC relationship for laboratory space and lab analyses.

#### **University Integration**

The approval by the Florida Polytechnic University Board of Trustees to authorize funding allocation for a new building on main campus to house the operations of the Florida Poly Environmental Engineering Department in tandem with the operations of Florida Industrial and Phosphate Research Institute marks a watershed moment in the Institute's history. The Board of Trustees' recognition of the potential synergies between the two groups is a harbinger of the great contributions this relationship will make to the environment and economy of central Florida and beyond.

The FIPR Institute's strategic and operational decisions and activities over the past year have all been made with the new building authorization front of mind. Facility decisions for the current location have acknowledged both the need for continuity of the critical work being performed by the Institute on a day-to-day basis, as well as the continued role of the FIPR campus in Bartow as an important component of Florida Polytechnic University's role as an economic driver in central Florida.

The following projects represent collaborative research between the FIPR Institute and Florida Polytechnic University:

#### FarmBot

The FIPR Institute purchased a commercially available robotic farming system called "FarmBot" to test the efficacy of this food-growing system. The efficiency will be determined during the installation and implementation on the grounds of the FIPR Institute. Additional work is planned to test "prescriptive" slow-release fertilizers in conjunction with an industry partner and develop additional 3-D printed tool and sensor attachments. Florida Polytechnic University student workers and interns have worked alongside FIPR Institute staff for the initial installation and testing of this novel technology.



FarmBot initial installation and testing, Summer 2020.

#### **Capstone Drone Project**

The FIPR Institute acquired a DJI 600 Matrice Pro drone to perform photogrammetry land analysis. Florida Polytechnic University Capstone Project students involved with the FIPR drone work utilized data captured from the drone camera and analyzed with Pix4D software to ascertain the amount of buildable acres in a land development zone surrounding Florida Polytechnic University. These Capstone Project students learned to operate the drone, develop and download flight plans, coordinate the data transfer to software and then provide the required analyses.



SurvTech Solutions, Inc., a local professional surveying firm, provided an in-person introductory presentation on their use of drones in commercial surveying. Specific information on the DJI Matrice 600 drone they use was very helpful to Florida Polytechnic University Capstone Project students and FIPR Institute staff.



Photogrammetry orthomosaic and the corresponding Digital Surface Model (DSM) of the Capstone Drone Project property of interest.

#### Capstone CMC Water Clean-up Project

The FIPR Institute helped match its partner, CMC, with a group of Florida Polytechnic University students enrolled in the Capstone Project. The students worked to design and facilitate a remote system for monitoring wastewater treatment technology and for controlling the flow through the system.

More information available at: <u>https://floridapoly.edu/academics/capstone-design/2020-21.php</u>

(Look for "Smart Drone Land Surveillance" and "Remote Monitor of Wastewater Discharge" for these two FIPR Institute-sponsored Capstone projects.)

#### **Grant Proposal Submissions**

#### The "DOE REE" Project (proposed)

The FIPR Institute applied for a United States Department of Energy grant for \$150,000 to utilize noncoal-based feedstocks to produce high purity MREO/MRES, testing the efficacy of REE extraction from phosphoric acid sludge. The project has been nicknamed "DOE REE." This proposed research is an effort to create a REE supply chain in Florida utilizing the production process of phosphate mining. The application was submitted during Fiscal Year 2020-2021 and award notice is expected in July 2021. If obtained, this grant is for an initial development step in a bigger research effort commonly funded in a subsequent year. The potential for Year Two - Five funding is up to \$4.4 million. *(Update: on August 23, 2021 the FIPR Institute received official notification from the DOE that the grant application was approved.)* 

#### CMI FY 2021-2022

For the eighth year the FIPR Institute has applied for and been granted continuing funding from CMI. The 2021-2022 grant is for \$230,000 for continued research on REE extraction from phosphate processing streams.

### **FIPR Institute Financial Report**

FIPR Institute's research and operations are funded through the Phosphate Research Trust Fund, revenues from testing services, and externally funded research projects. Trust fund income is from a portion of the severance tax paid to the state (approximately 6%) for each ton of beneficiated phosphate rock concentrate and pebble (not dry) as measured coming off the belt at the washer of each beneficiation plant, as well as interest income on the Trust Fund balance.

Since the Institute's inception in 1978, the severance tax rates, distribution, and associated fees have varied greatly, as has the rate of mining. This has, in turn, resulted in widely variable rates of income for the Phosphate Research Trust Fund. The distribution to the Institute's trust fund has varied from 5% to 12.5% of the collected tax during our history. The distribution was 5.6% for this fiscal year, and the tax rate was \$1.80 per ton of rock severed.

The FIPR Institute's Executive Director and Business Director provide a summary of expenditures and the trust fund balance at public meetings of the Institute's Phosphate Research and Activities Advisory Board.

FIPR revenues for the past four years, with the revenue sources identified are shown in the figure below. Revenues have been in the \$1.5M to 2.0M range with severance tax distribution being the dominant income source. Federal contracting and testing services remain an important revenue stream to FIPR.



FIPR Institute revenue, all sources.

Salaries and benefits are the dominant expense with Contracted services being relatively large as well. A portion of contracted services includes payments to third parties that contribute to the research mission (for instance payments to Madrid Engineering as a partner on the Smart Road project).



FIPR institution-wide expenses, listed in "typical" expense categories.



FIPR Institute expense percentages.



FIPR Institute expense break-down.



FIPR Institute research expenses versus total expenses.

Trust fund balance is also shown for the last four years, with a continuing decline in the balance over the years. In the coming years, we will use the FIPR reserves to carefully invest in improvements in laboratory services and also in increased staff and faculty technical capacity (in collaboration with the Environmental Engineering Department). The addition of the Environmental Engineering Department faculty has been done at university expense but the expertise that they bring is critical to the future research direction for FIPR.



FIPR Institute ending balances.

The overall financial status for FY 2020-2021, which combines the Trust Fund and Auxiliary Fund, was \$7,206,318.87 as of July 1, 2020. The fiscal year ending amount for the Trust Fund and Auxiliary Fund, as of June 30, 2021, was \$6,935,492.30; showing a net decrease of \$270,826.57. Auxiliary Account balance increased from July 1, 2020 to June 30, 2021 by \$74,409.38. In FY 2021-2022, the Auxiliary and Contracts and Grants Research Accounts will be drawn down to relieve spending of the Trust Fund Account. It is anticipated that in FY 2021-2022 the Trust Fund balance will increase. In Fiscal Year 2020-2021, the FIPR Institute contributed \$200,000 to Florida Polytechnic University for shared services (payroll, administration, legal, etc.). In Fiscal Year 2021-2022, that shared services contribution is being modified to \$120,461 (6% scrape on revenue, paid quarterly), less than in prior years.

# FIPR Institute Phosphate Research and Activities Advisory Board

#### Robert Fredere, Mosaic

Chair



Mr. Robert Fredere, Jr. serves as the Chair of the FIPR Institute Research and Activities Advisory Board and has been a board member since 2017. Mr. Fredere has worked for Mosaic for over 16 years and is currently the General Manager of the New Wales Plant in Mulberry, Florida. He is accountable for chemical plant HSE performance, community & employee relations, production, maintenance, quality, compliance, financial performance & cost control as well as all other operational-related activities.

#### Vishwas Sathe, Florida Department of Environmental Protection Vice Chair



Mr. Vishwas Sathe is an Environmental Administrator for the Phosphate Management Program in the Division of Water Resource Management at the Florida Department of Environmental Protection. Mr. Sathe currently serves as the board's Vice Chair and has been an active FIPR Institute Research and Activities Advisory Board member since 2012.

#### Dr. Randy Avent, President of Florida Polytechnic University



Dr. Randy K. Avent is founding president of Florida Polytechnic University, the state's only public university dedicated 100% to STEM. Named the University's inaugural president in 2014, Avent is responsible for its development and operation, and is committed to strategically advancing Florida Poly as a research-and-jobs institution, an agent for growth, and a beacon for the economy.

His career exemplifies the qualities of innovation, leadership, and entrepreneurship the University seeks to instill in students. An accomplished academician, senior administrator, and research scientist, Avent has an extensive background teaching and directing research at higher-education institutions dedicated to science, technology, engineering, and mathematics (STEM). Dr. Avent has served on the FIPR Institute Research and Activities Advisory Board since 2014.

More information available at: <u>https://floridapoly.edu/directory/staff/randy-avent.php</u>

(Environmental Representative, yet to be confirmed) Nominee: Mark Rachal, Florida Audubon

#### (Second Industry Representative, yet to be confirmed) Nominee: Mark Mitchell, Nutrien

Please note: The FIPR Institute is awaiting formal confirmation of these two nominated board representative seats by the State of Florida Governor's Appointments Office.

## **FIPR Institute Staff**

Dr. Terry Parker, FIPR Institute Executive Director Dr. Jim Mennie, FIPR Institute Business Director Dr. Patrick Zhang, FIPR Institute Research Director, Mining and Beneficiation Gary Albarelli, FIPR Institute Director of Information Programs Malysavanh Birky, FIPR Institute Library Assistant Aaron Medley, FIPR Institute Technical Project Manager Dr. Zhen Jin, FIPR Institute Senior Chemist Abner Gonzalez, FIPR Institute Laboratory Technician Omar Pantoja, FIPR Institute Laboratory Technician Cathy Hoar, FIPR Institute Research Technician Kate Kaste, FIPR Institute Communications and Marketing Officer Marie Wilmot, FIPR Institute Office Manager Lisa Thompson, FIPR Institute Receptionist



FIPR Institute staff and Florida Polytechnic University student workers pose immediately after completing a morning of challenging outdoor team building activities, June 2021.



FLORIDA POLYTECHNIC UNIVERSITY