

INTERNATIONAL PHOSPHOGYPSUM WORKING GROUP (PGWG)



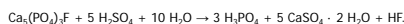
<http://pgwg.stackfree.com/Home.aspx>



Aleff Group, UK, Al-Hussein Bin Talal University, Jordan, Comissão Nacional de Energia Nuclear (CNEN) Brasil, Florida Industrial and Phosphate Research Institute (FIPR), USA, Groupe Chimique Tunisien (GCT) Groupe OCP, Morocco, Institut Agronomique et Vétérinaire Hassan II, Morocco, International Atomic Energy Agency, International Center for Agricultural Research in the Dry Areas, Rothamsted Research, UK, University of Seville, Spain, and many more...

Introduction: What is PG?

Phosphogypsum (PG) - calcium sulphate - is produced together with phosphoric acid (P₂O₅) by the "wet process" method of digesting phosphate rock.



Some 5-6 tonnes of PG are produced for every tonne of phosphoric acid (P₂O₅).



It is estimated that some 3 billion tonnes of PG are currently stored in stacks worldwide. New PG is generated at the rate of some 175 million tonnes a year. There are stacks in more than 50 countries, some active, some closed, some lost or abandoned.

Safe, Sustainable Uses of PG

The practices of indefinite land-stacking of PG or ocean discharge are rapidly giving way to large-scale PG use, especially in emerging economies. Based on the body of scientific evidence, three categories of large-scale PG use are safe and sustainable:

- 1. Agriculture**
 - soil remediation (sodic and saline soils)
 - fertiliser (over 50 major crops tested)
 - soil conditioner
 - water efficiency (dry areas)
- 2. Construction**
 - cement
 - wallboard
 - low-cost panels
- 3. Road building**
 - wet-dry
 - freeze-thaw
 - low life-cycle cost

Soil amendment – Huelva, Spain



Large-scale agricultural application - Brazil



PG roadbase Parrish Road, Florida



Housing - China



4. Experimental uses are under investigation in landfill / waste management and coastal stabilisation.

Phosphates: A NORM¹ Industry

Phosphate deposits contain naturally occurring radioactive materials (NORM) notably radionuclides ²³⁸U and ²³²Th and their decay products. In sedimentary phosphate rock, the uranium content is high enough for commercial recovery.

The presence of these radionuclides creates a potential need to control exposures of workers and members of the public.

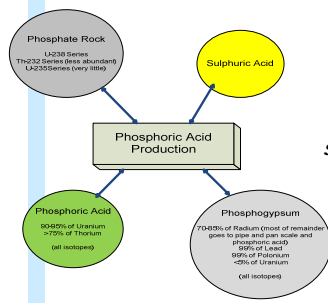
- The P industry is the subject of an IAEA Safety Report, now in the process of publication.
- World-wide, regulations regarding the radionuclide content of phosphogypsum in particular, but also phosphate fertilisers in general, are very diverse – even conflicted.

1. Assessing the Need for Radiation Protection Measures in Work Involving Minerals and Raw Materials, Safety Reports Series No. 49, IAEA, Vienna, (2006)

Phosphogypsum Stacks: Huelva, Spain



Radionuclide Migration into Phosphoric Acid and Phosphogypsum



SFAX - PG Remediation Step 1: "Stack Free"



SFAX - PG Remediation Step 2: Amenity Land – Public Park



The Stack Free Project

Since 2005, FIPR has partnered with Aleff Group in the project **Stack Free by 53**. This partnership is led by Dr. Brian Birky and Professor Julian Hilton as Co- Principal Investigators. (www.stackfree.com). Stack Free has assembled and analysed a very large repository of knowledge and experience in PG use, accessible on line.

The Florida Industrial and Phosphate Research Institute (FIPR) has been working on safe, beneficial uses of PG since 1979. FIPR has amassed and published a large body of evidence about PG both in research and applications, much in the public domain. See <http://www.fipr.state.fl.us>

Stack Free: Project Outcomes

- Manuals and Technical Overviews
- Road Building
- Agriculture
- Construction
- Sulphur Recovery
- Scientific and Technical Publications
- PG Safety Framework (radionuclides and heavy metals)
- Dedicated PG Competency Centre with associated training programme and materials
- Good PG Management Practices
- Taxonomic list of stacks and estimated stored tonnages
- Searchable database of 2,000+ publications on PG use and related topics
- Case studies, diagnostics and assessment tools eg score cards
- Comparative review of regulations

Acknowledgements

The authors would like to acknowledge the visionary leadership of G. Michael Lloyd Jr., Director of Research, FIPR in the search for safe, beneficial uses of PG and for his support for the PGWG in particular.

The International PGWG

The international Phosphogypsum Working Group has its origins in joint meetings of the Stack Free project and the IAEA. (2006). These led to formal joint meetings of the IAEA and FIPR (2006, 2007), both held at FIPR, resulting in a range of activities:



- Creation of the Phosphogypsum Working Group with members drawn from industry, academia and regulators
- IAEA sponsored meetings on PG, in 2008, 2009 and 2010
- A series of special workshops, such as at IRPA 12 (2009) and NORM VI (2010)
- An assessment of the available evidence base regarding PG safety and possible use.
- The IAEA Phosphate Industry Safety Report (in press)
- A dedicated PGWG website, sponsored by Aleff Group <http://www.pgwg.stackfree.com/Home.aspx>
- An International PG Action Plan (2011-2014) focused on safe, sustainable use.

Vision

PG is a resource not a waste

Mission

Find the point of equilibrium between PG production and consumption based on safe, sustainable use.



PG Use – Guide Principles

1. Regulatory approaches to using PG should be evidence-based, constructive and focused on social and environmental as well as economic return
2. In following a policy of sustainability and resource conservation PG has a significant and well-demonstrated role to play in use of found materials and the conservation of virgin resources
3. In the context of definitions of waste, PG has both foreseen and foreseeable uses and is thus not to be managed as a *de facto* waste.

Training, Capacity-building and Technical Assistance

Training, capacity-building and technical assistance services are available to PG producers, users and regulators. These include occupational, public and environmental health and safety, project planning and project management.

PGWG CONTACTS

For further details or for information:

Dr. Julian Hilton, PGWG Co-ordinator

Tel: +44 20 7515 9009; Fax: +44 20 7515 5645

Email: jhilton@aleffgroup.com

Web: <http://www.pgwg.stackfree.com/Home.aspx>