ICL-IP: Leading supplier of Flame Retardant solutions for the foam industry.

October 2019, ANPE 4th National Conference Rigid PU foam. Rome – Italy.
ICL Target

Ensure fire safety in building and construction for saving lives while innovating towards most sustainable flame retardants.
Our Value Proposition

- Long-term commitment to the FR market
- Reliable supply
- Innovation, R&D, in-depth understanding of applications and processes, analytical and applicative support
- Regulatory support
- Information and knowledge sharing
- High and stable quality performance
ICL Group

HISTORY

Establishing & growing operations in Israel 1920s - 1970s

- Establishment of potash & bromine production at the Dead Sea
- Establishment of Dead Sea Bromine and Negev Phosphates

Consolidating & expanding globally 1970s - 2014

Global M&A

- Amfert - Netherlands
- BK Guillini - Germany
- Astaris - US
- Iberpotash - Spain
- Cleveland Potash - UK
- YPH JV - China

- Phosphates
  - Establishment of Rotem Amfert Negev & Bromine Compounds
  - Global expansion of bromine, phosphorous, magnesia and salts activities
  - The State of Israel issues 25% of ICL in the Tel Aviv Stock Exchange and sells 52% to Israel Corp

- Potash
- Phosphates

- Focus on innovation and solidifying leadership 2000s -

- Focus on value added solutions
- Growth of specialty fertilizers
- Transformation of YPH JV into production of specialty phosphates
- ICL UK transition to exclusive production of polysulphate
- Creation of the FertilizerspluS platform
- Enhancement of global leadership and creation of innovative solutions
ICL Group

4 DIVISIONS

ICL potash helps farmers increase yields and feed the world

ICL provides essential ingredients for various industrial and food applications

ICL’s bromine solutions are all around us, making consumer goods safer and production more efficient & sustainable

ICL specialty fertilizers provide growers with optimal plant nutrition solutions

Potash Division
ICL potash helps farmers increase yields and feed the world

Phosphate Solutions Division
ICL provides essential ingredients for various industrial and food applications

IAS - Innovative Ag Solutions
ICL specialty fertilizers provide growers with optimal plant nutrition solutions

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ICL Industrial Products

SNAPSHOT

Produced

MgCl
Salts
KCl

Specialty Minerals plants:
Israel
France*

Bromine compounds plants:
Israel
Netherlands
China

Customers

Phosphorus compounds plants:
Germany
USA

Purchased

* RM sourced from 3rd parties
ICL Industrial Products

MAJOR END MARKETS & GLOBAL TRENDS

- Standard of living
- Population
- Regulation & Environmental

- Electronics
- Transportation
- Construction
- Furniture & Textile
ICL Industrial Products

MARKET LEADERSHIP

#1

in Flame Retardants
in Bromine capacity
in Bromine compounds plant
in Bromine Iso-tank fleet
in Brominated biocides
in Phosphorus FRs
in Clear Brine Fluids
in Self-extinguishing Hydraulic fluids
in Solid MgCl
in Magnesia for Nutraceutical market

Sales by Business Line

- Flame Retardants
Flame Retardants

**SUSTAINABILITY**

- Other green initiatives  [http://www.icl-group.com/sustainability/GreenInitiatives/Pages/default.aspx](http://www.icl-group.com/sustainability/GreenInitiatives/Pages/default.aspx)
- Recycling projects
  - PS-Loop (recycling of post-construction EPS); Black Demon (recycling of flat panel displays); CloseWEEE; Plast2BCleaned; RecoPhos; ...
- Ecovadis
  - ICL ranked among 7% top global suppliers for sustainability
- [www.SAFRworks.com](http://www.SAFRworks.com)
ICL IP R&D Centers

Beer Sheva, Israel

- Main R&D for Bromine FR
- Main R&D for Inorganic FR (Magnesium Hydroxide)
- Application and technical support for
  - Thermoplastics
  - Textiles
- Formulation
- Analytical

Tarrytown, USA

- Main R&D for Phosphorus FR
- Application and technical support for
  - PU Foams
  - Thermoplastics
  - Textiles
  - Thermosets/PWB
  - Functional Fluids
- Analytical

Haifa, Israel

- Chemical & Process Engineering Services
- Chemical Development
- Application and technical support for Flame Retardancy.
- Analytical
Flame Retardants

PRODUCT PORTFOLIO

• **Fyrol™**: PFRs, mainly for PU foam (rigid and flexible)
• **Fyrolflex™**: RDP and SolDP (PC/ABS and PPO/HIPS)
• **Phosflex™**: Plasticizers (mainly PVC, but also in coatings)
• **Brominated FRs (FR-xxxx)**
  • Low molecular weight
  • Polymeric
    • Brominated Epoxies (various MWs)
      • F-2000 series
      • F-3000 series (end-capped)
• **Magnesium Hydroxide (FR-20)**
  • Various Particle Sizes/Surface Areas: S5, S7, S10
  • Various surface treatments: stearic acid; vinyl silane, aminosilane, polymeric
• **Innovative FRs**
  • PolyQuel™ for PCBs
  • VeriQuel™ for PU foams
Commonly used FRs in PU foams

TCPP

• Flame retardants are added in PU foams to meet appropriate fire safety standards.
• Most widely FR used PU foams are TCPP – Tris(1-chloroisopropyl)phosphate.
• Growing concerns about chemical exposure and its migration into the environment.

• Challenges for TCPP:
  • Ubiquity claim; found in breast milk, fish, household dust, indoor and surface water.
  • Placed in CoRAP list by Denmark based on a read accross TDCP; concerns addresses: Reprotoxicity, Endocrine Disruption, Carcinogenicity.

• ICL still believes TCPP to be safe and plans to continue produce it.
• Nevertheless, there is a push towards more sustainable new products with improved HSE profile and minimal potential for migration out of the matrix.
VeriQuel\textsuperscript{TM} R100

Stronger, safer and more efficient than TCPP

- Halogen Free
- Reactive $\rightarrow$ no emissions or migrations
- Similar processability to TCPP $\rightarrow$ minor changes in formulations
- Same fire spread performance
- Less smoke production
- Same thermal performance
- Improved mechanical performances of the foam

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VeriQuel™ R100

Negative publicity and potential deselection of PU foams products can be avoided by choosing the sustainable alternative FR’s now.
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