DESCRIPTION

Selection of sealants

The proper application of sealants involves not only choosing the material with the correct physical and chemical properties, but also ensuring:

- The good understanding of the joint design,
- The substrates to be sealed,
- The performance needed,
- And the economic costs involved in the ***installation*** of the joint sealant.

Typical considerations in selecting a sealant type for the construction industry are:

- ***Joint Design***:
  - The specifics of the joint design and configuration must match up with the sealant's movement capabilities in installed conditions.
  - The practicality of placement and aesthetics also need consideration.

- ***Physical and chemical properties***:
  - Mechanical properties of the sealant like
    - Modulus of Elasticity,
    - Stress/strain recovery characteristics,
    - Tear strength,
    - And fatigue resistance are all factors—
      - That influences the sealant performance in a joint.
      - The polymeric composition along with other additives will affect the regulatory compliance of the product.

- ***Durability properties***:
  - The adhesion properties of the sealant to the specific substrates—
  - The aging properties of the cured sealant—
    - as they relate to its resistance to:
      - ultra-violet radiation,
      - moisture, temperature,
      - cyclic joint movement
      - and bio-degradation
        - Can profoundly influence the service life of the installed sealant.

Application/installation properties:

- Considerations important to the consistency of the sealant include:

- Open/tool time (pot life),
- Tack free time,
  - Application temperature range, and low temperature "gunnability"
    - (i.e. ability to be dispensed easily by sealant gun).
  - Sealants used for interior applications,
  - Properties and needs different from those used in other applications,
    - Such as structural glazing or exterior building facades.

Key Features of Sealant Chemistries
Joint sealants come in many different types, and include:

Liquid Applied in the Field

- **Latex** (water-based, including EVA, acrylic)
  - Used mainly in residential and light commercial construction applications
  - Interior and/or exterior uses
  - Premium products meet ± 25% movement (ASTM C 920, class A)
  - Excellent paintability (with latex paints)
  - Very good exterior durability
  - Exhibit some shrinkage after cure
  - Sometimes referred to as caulk
  - Not used for exterior applications on high rise construction or for applications undergoing significant cyclic movement

- **Acrylic** (solvent-based)
  - Used in residential and light commercial construction, mainly for exterior applications
  - Generally meet ± 12.5% movement (ASTM C 920, class B)
  - May need special handling for flammability and regulatory compliance
  - Can be painted
  - Short open time; difficult to tool
  - Exhibit some shrinkage upon cure
  - Often used for perimeter sealing; low movement joints

- **Butyls** (solvent-based)
  - Excellent adhesion to most substrates
  - Limited movement capabilities, generally up to ± 10%
  - Excellent weathering
  - Good use as adhesives in industrial and packaging applications
  - Sometimes used in curtain wall applications where adhesion to rubber compounds is needed
  - Most are stringy and difficult to apply neatly
  - May show some shrinkage after cure; may harden and crack over time on exposed surfaces

- **Polysulfides**
  - First "high performance" sealant chemistry; mainly used in industrial applications
  - Poor recovery limits their use in joints with high cyclic movements
  - Can be formulated for excellent chemical resistance (especially for aviation fuel)
  - Good performance in submerged applications

    - Require primer on almost all substrates

- **Silicones**
    - Structural bonding and stop-less glazing of glass to frames
    - Very good joint movement capabilities; can exceed ± 50% (ASTM C 920, class A)
    - Excellent UV and heat stability
    - Good adhesion to many substrates especially glass; often a primer is recommended on many substrates, particularly porous substrates
    - Not paintable
    - Used in protective glazing systems and to insulate glass to improve thermal performance (reduce heat loss). Also designed for missile impact and bomb blast situations)
    - Acetoxy chemistry based sealants have strong odor, but newer chemistries have very low odor
    - Adhesion is adversely affected by less than perfect application conditions
    - High, medium and low modulus materials available
    - May stain some types of natural stone without primers

- **Polyurethanes**
    - Used in industrial and commercial applications
    - Excellent movement capabilities, up to ± 50% (ASTM C 920, class A)
    - Not used in structural glazing applications (avoid direct contact to glass)
    - Excellent bonding, generally without a primer for many surfaces
    - Can be formulated for good UV resistance
    - Paintable
    - Some formulations may contain low levels of solvent

Factory Molded

- Gaskets and seals
- Strip-seals
- Compression systems

The following table shows different sealant formulations, rated for selected applications: (1=no rating, 2=poor, 3=good, 4=excellent)

Use	Latex	Acrylic	Butyl	Polysulfide	Silicone	PU
Submerged	1	4	3	4	1	4
Interior	4	4	3	3	3	4
Exterior	1	2	1	3	4	4
Structural Glazing	1	1	1	1	4	1
Window Perimeter	1	2	1	3	4	4
Expansion Joints	1	1	1	2	4	4
Traffic Joints	1	1	1	3	2	4
Wide Joints	1	1	1	1	2	3
Paintable	4	3	2	1	1	4
Chem. Resistant	1	1	1	4	1	3
EIFS	1	1	1	1	4	4
Tilt-up	1	1	1	2	3	4
Pre-Cast	1	1	1	2	4	4
Cast-In-Place	1	1	1	2	3	4
Brickwork	1	1	1	2	2	4
Curtain Wall	1	1	2	2	4	2
UV Resistance	1	3	2	3	4	3