A Comparison
Between Older Generation
Sodium and Potassium Silicate Products
and
New Generation
Lithium Silicate Technology
for
Concrete Protection

History:

Around World War II, many chemical companies began making sodium and potassium silicate products to harden and protect the surface of concrete. These companies, including Sika, Euclid Chemical, Curecrete Chemical, Master Builders, Sonneborn, Lafarge, W.R. Meadows, AB Linde and Noxcrete, all produced their own brand of a silicate hardener. These products were fairly reliable and worked most of the time.

The Chemistry

Sodium and Potassium Silicates

Silicates and siliconates have one silicon (carbon) atom bonded with 3 or 4 oxygen atoms. The higher alkalinity of the sodium and potassium silicates causes a fast, violent reaction with the available free calcium in the concrete, leaving clumps of unreacted calcium hydroxides behind that will absorb moisture.

Lithium Silicate

Compared to sodium and potassium silicates, Lithium has lower alkalinity and lower viscosity. This makes the reaction in concrete slower and more even. When lithium reacts with the free calcium in concrete, it forms insoluble tricalcium silicate structures that are stronger and more stable, and keeps moisture out of the concrete better. The lower alkalinity makes the concrete less likely to effloresce. The lower viscosity also means the penetration is better.

Alkali-Silica Reactivity (ASR)

Alkali-Silica Reactiviy is a world-wide problem that causes cracks and microcracks in concrete. It occurs when reactive, high-alkali aggregate, silica, and water combine to form concrete. The resulting reaction forms an expansive gel that fractures concrete. Sodium and potassium silicates are higher in alkalinity and may contribute to ASR. Lithium-silicates fight ASR in three ways: 1) keeping moisture out, 2) reducing alkalinity, and 3) introducing lithium into the reaction, which can calm and even stop the ASR reaction.

TESTS RESULTS ANALYSE

Sodium or Potassium Silicates (A.F) **Pentra Products PS /244+**

ASR PROBLEM

CAN CONTRIBUTE TO ASR **STOP ASR PROBLEM**

CURING TEST

Time	24h	72h	7 days		24h	72h	7days
TEST							
ASTM C309	50%		17%	*	94,25%		66%
Astm C309 1							
Improvement				*	**+88%**		**>200%**
European Norms CenTC104sc3tg11	No Tested				**87%**		**41%**

**: The European tests was run with Pentra-Sil and Pentra-Sil 244+ with addition of our new product Pentra-Cure.

ABSORTION TEST

TEST		
Rilem 25 Pem Report 71.514	42 %	53%
Improvement Rilem 25 Pem De611.682		22%
Triplett Barton Lab Report 5-9409	38,6%	Not tested
European norms En1062-3	No tested	85%

	Sodium/Potassium Silicates	Pentra Products

ABRASION TEST

Taber Abrasion tester	12%	46%
Smith Emery Lab		
Test 7.11 CC		
Revolving disk 1 hour	22%	Not tested
Amsler Test	10%	60%
Improvement		>100 %
European norms		
EN 1766(Homogenous material)	Not tested	15%

HARDNESS TEST

Mohs Scale Test
Arrow Laboratory

Concrete C 0,70	Not tested	120%
Concrete B 0,25	16%	60%
IMPROVEMENT		>200%

PAINT ADHESION TEST

After exposure to high PH
and Moisture

PSI at bond break	65	230
IMPROVEMENT		72%

FMC Laboratory

ACID RESISTANCE TEST

Loss to erosion

Weight	3,72	2,42
IMPROVEMENT		35%