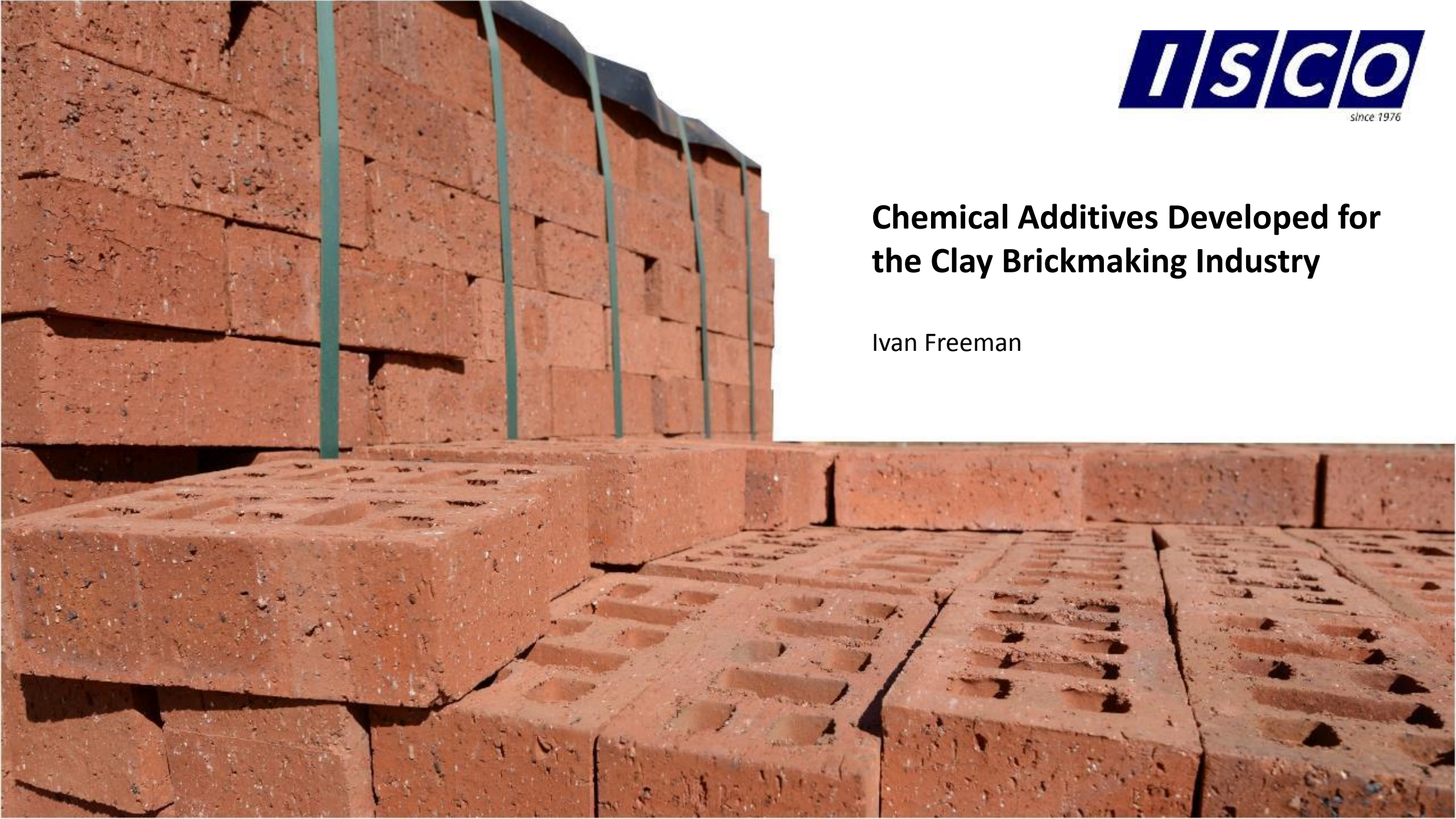


Chemical Additives Developed for the Clay Brickmaking Industry

Ivan Freeman



QUESTIONS FREQUENTLY ASKED BY CLAY BRICKMAKERS:

- Are chemical additives really needed in the brickmaking industry?
- Can they make a difference to the inherent properties of a naturally occurring clay body?
- Will the use of additives alter the existing manufacturing process?
- What benefits can I expect if I use additives?
- What are the likely cost implications?





ANSWERS DEPEND ON:

- Do you have the perfect clay body?
- Do you know and understand the geochemical and geophysical properties of the material that you are converting into clay bricks or pavers?
- Are you able to extrude at the design capacity of your extruder?
- Are your total production waste levels acceptable?
- Is the quality of your finished product consistent?
- Does the market like the product that you currently make?
- Would you like to effect changes to the appearance of the product that you currently make?

If you have answered “no” to any one of the previous questions then there is merit in investigating the potential benefits and the nett cost of using additives.

HOW WILL I KNOW WHICH ADDITIVES TO USE?

- In the body preparation prior to extrusion?
- In the rheology control during extrusion?
- In lubricating the column as it moves into the oil bell and die box?





THERE ARE NO SHORTCUTS

- You have to know and understand the geochemical and physical properties of the material that you want to work, and determine how sensitive the body is to composition changes.
- Use professionals to develop a data base for your material

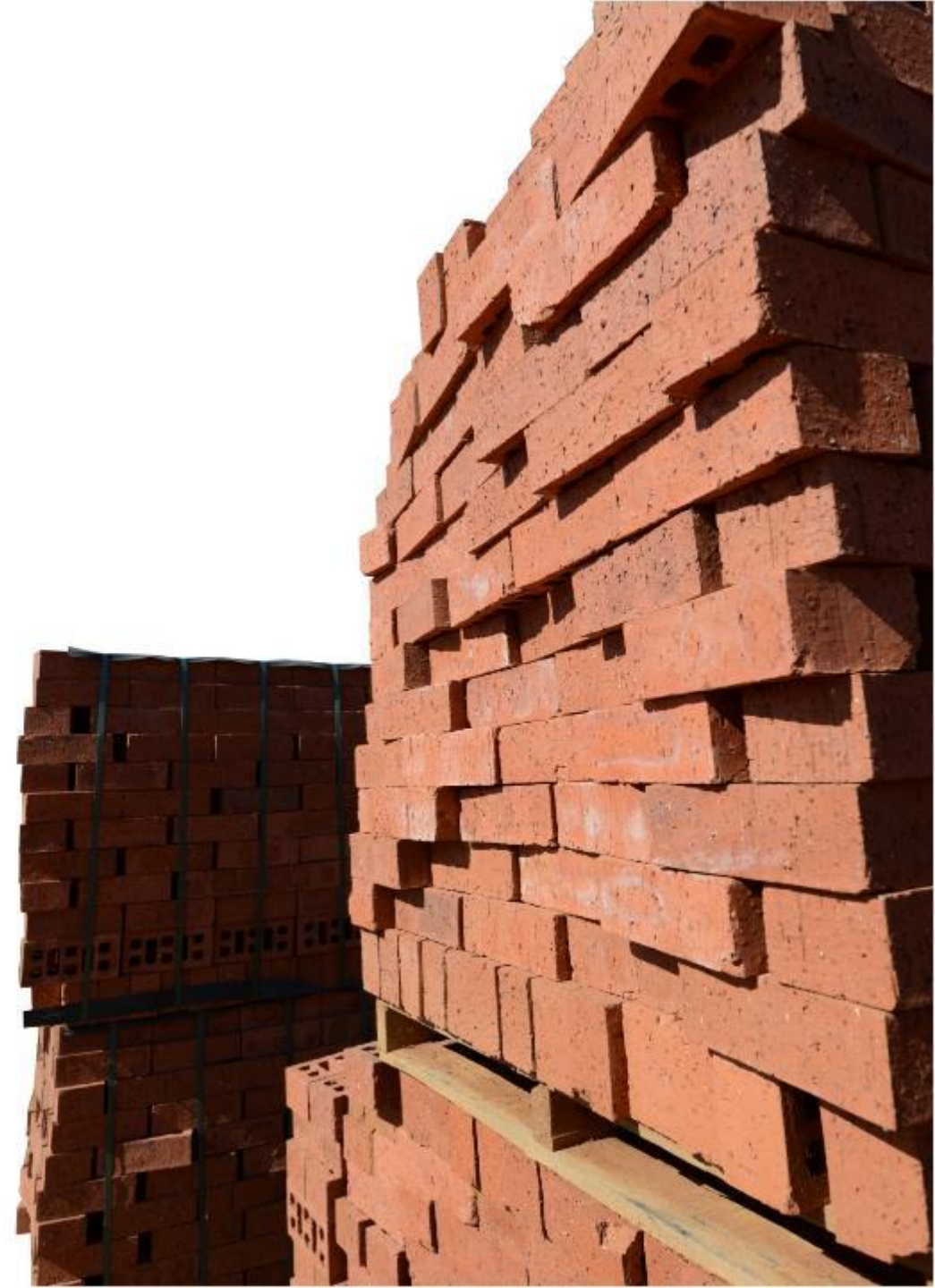
WHY SHOULD I USE PROFESSIONALS?

- The cost of equipment and staffing a laboratory is substantial and goes way beyond the financial and technical resources of most brick makers.
- Don't be penny wise and pound foolish.
- Pay the professionals but make sure that you are getting value for your money.
- An audit of the consequences of their recommendations should be the only basis used to measure the benefits in relation to costs.



THE EFFECTS OF ADDITIVES ON A CLAY BODY

- Additives are capable of altering the rheological properties of clays and will enable you to extrude a stiffer column with less water.
- You will have better dimensional control and the green strength of the extruded brick will improve.
- Additives can be used to address shortcomings in a clay body such as:
 - Hydration
 - Thixotropy
 - Dilatency
 - Syneresis
 - Rheopectism



ARE ADDITIVES A NEW CONCEPT IN CERAMIC TECHNOLOGY?

No!

Additives have been used for centuries, even in the days when clay bricks were hand made.

So what's new?

As technology and mechanisation evolved, the demand for new and improved additives increased.

Iscosa is proud to have played a part in this development.





ORIGINAL ADDITIVES

- Urine
- Ligno sulphonates
- Wet cow dung
- Molasses
- Poly acrylates
- Albumen (egg white)
- Collagen

NEW TECHNOLOGY PRODUCTS

- Clayfix
- Magnafix
- Clay speed blend
- Extrude all
- Souring fluid
- Crack stop
- Extruder lube
- Ultra havis die lube
- Iscolube
- Glide easy

PRODUCTS: WATER BASED ADDITIVES

CLAYFIX

- Clayfix is a potassium enriched aqueous blend of modified vegetable and mineral oils, polymers, polyelectrolytes, surfactants and modified starches.
- Clayfix is a general purpose rheology modifier that will enable you to extrude a stiffer column using less water.
- The cellulosic polymers regulate the thixotropy of the body and keep the ultra fine particles homogeneously dispersed throughout the column.
- This leads to a better packing density and, consequently greater green strength.
- Clayfix inhibits the development of efflorescence and scumming.
- The lubricating properties of Clayfix reduces wear on mixer knives, augers and liners.



PRODUCTS: WATER BASED ADDITIVES

MAGNAFIX

- Magnafix is a magnesium enriched version of Clayfix designed to address magnesium deficiencies in clay bodies formed during the degradation of granites.
- The presence of magnesium acts as a thermal stabiliser during the quartz inversion phase of the firing cycle.
- Magnafix is recommended for use in clay bodies that contain elevated levels of free quartz. It is used extensively in the manufacture of pavers where silica sand is added for dimensional control.
- In addition to the above, Magnafix will stabilise the rheology of the body allowing stiffer extrusion with less water and hence lower drying shrinkage.
- The lubricating properties of Magnafix reduces wear on mixer knives, augers and liners.



PRODUCTS: WATER BASED ADDITIVES

CLAY SPEED BLEND

- Clay speed blend is a combination of Clayfix, Magnafix , Polyacrylamide and Extruder Lube.
- It was developed specifically for abrasive refractory clay bodies and those containing high levels of sand.
- Its primary function is to increase the extrusion rates of these highly abrasive bodies.
- The Polyacrylamide has been cross-linked with a coalescing agent to assist with the binding of the free quartz and sand and acts as a glide agent that reduces wear on augers, liners, oil bells and die boxes.



PRODUCTS: WATER BASED ADDITIVES

EXTRUDE ALL

- Extrude All is a specially formulated blend of modified oleoresin oils, surfactants and coalescing agents.
- It was developed initially for clay bodies that because of their excessive plasticity, need to be heavily grogged in order to maintain structural form during extrusion and prevent slumping during drying and firing.
- This product was developed for bodies containing fired clay grog but has subsequently been found to work effectively in metamorphosed talcose schists and bodies containing kimberlite tailings.



PRODUCTS: WATER BASED ADDITIVES

SOURING FLUID

- Souring fluid is an aqueous solution of powerful dispersing agents that accelerate the souring process of freshly mined clay bodies.
- It contains an anionic cellulosic polymer to prevent rapid drying and hardening in the layered stockpile.
- The importance of souring should not be overlooked. The correct body preparation is key to making quality products and reducing waste.
- Souring improves plasticity and green strength of formed clays.





PRODUCTS: WATER BASED ADDITIVES

CRACKSTOP

- Crackstop is a blend of Extrude-All, selected starches and polysaccharides.
- It was developed specifically to treat drying sensitive clays and clays that have poor bonding capacities.
- The coalescing agents boost the bonding capacity of the body and have shown a significant contribution to dry green strength development.

PRODUCTS: WATER BASED DIE LUBRICANTS

EXTRUDER LUBE

- Extruder Lube is an extreme pressure die lubricant and contains an aqueous blend of surfactants, vegetable oil esters and polyelectrolytes.
- It also contains metallophilic compounds and fluxing agents and has a very high shear strength enabling it to reduce rotational torque and friction by 68%.
- Extruder Lube reduces frictional wear on point augers and core bridges and die boxes and, if applied correctly, will reduce the extrusion temperature of the column.
- Extruder Lube produces a perfect satin finish to the column.



PRODUCTS: WATER BASED DIE LUBRICANTS

ULTRA HIVIS DIE LUBE

- Ultra high Viscosity Die Lube is a viscosified version of Extruder Lube and exhibits all of the properties of Extruder Lube.
- It was designed for use in clay bodies that are highly porous because of elevated levels of grog or free quartz.
- It is recommended to be used in conjunction with Clay Speed Blend and Extrude All.



PRODUCTS: HYDROPHOBIC DIE LUBRICANTS

ISCOLUBE

- Iscolube is a hydrophobic transester manufactured from recycled vegetable oils. It contains biowaxes and some virgin vegetable oil.
- It lubricates in exactly the same manner as mineral oil distillates, however, unlike the mineral oil distillates it is non-toxic and non-carcinogenic and has a significantly higher flash point making it safe to use in hard, hot extrusions.
- It is also used in trough idler sumps as a lubricant in the place of diesel.



PRODUCTS: HYDROPHOBIC DIE LUBRICANTS

GLIDE EASY

- Glide easy is a hydrophobic modified blend of a methyl ester and a transester and contains biowaxes and virgin vegetable oils.
- It was designed for use in push through cutters and swivel tables.



WILL THE USE OF ADDITIVES IMPROVE THE QUALITY OF MY PRODUCT?

YES!

BE WISE.

The benefits of using additives are:

- Controlled rheology
- Faster extrusion rate
- Stiffer column
- Less extrusion water
- Lower energy costs
- Reduction in wear parts
- Makes engobing possible
- Improves green strength
- Less waste
- Faster drying

Environmentally friendly

- Water soluble
- Non-toxic
- Bio-degradable
- Non-carcinogenic
- Non-allergenic



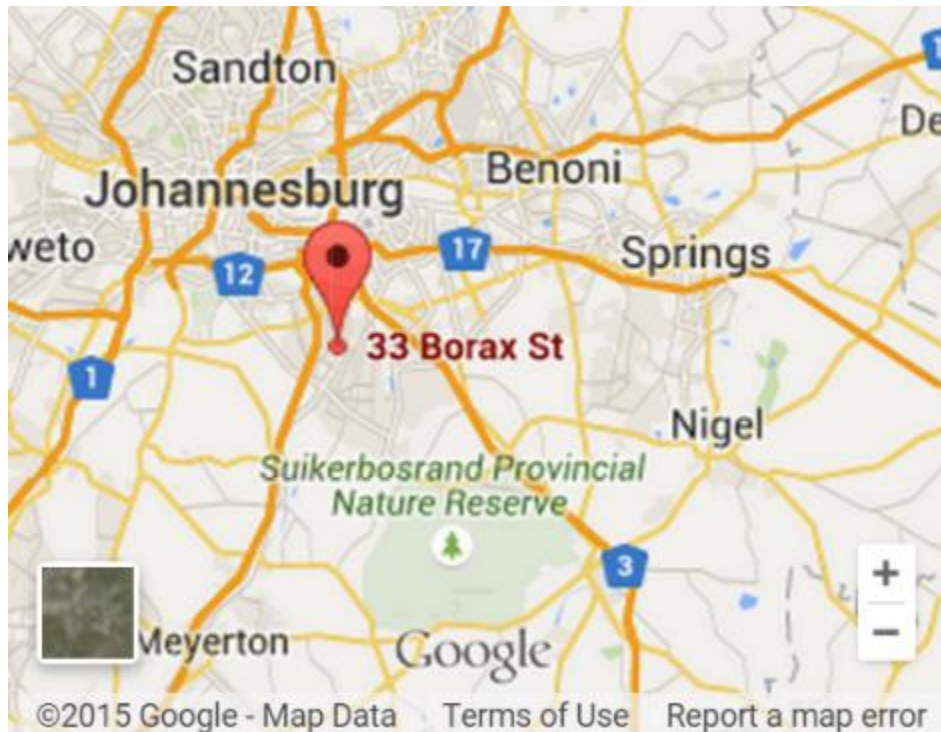
THE COST OF USING ADDITIVES IN THE BRICK-MAKING PROCESS

- As a guide to the cost implications of using additives the Table below sets out a worst case scenario for solid bricks and does not take into account the cost saving that will result from lower energy costs, reduced wear and faster drying.
- Prices are based on product prices as at 1 April 2015 and an average consumption of 6 liters of additive per 60 tonnes of clay worked.
- The cost will be lower for multi core bricks due to the lower clay content.

PRODUCT	COST PER 1000 BRICKS
CLAYFIX	R4.89
MAGNAFIX	R6.10
CLAYSPEED BLEND	R6.08
CRACK STOP	R4.23
EXTRUDE ALL	R12.72



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