Analysis Method

An attempt is made in the present study to use well known magnetic hysteresis-related concepts to help in the understanding of the Feeding Properties of printing blanket composites. A short glossary of terms relating to magnetic hysteresis, mainly as defined in Encyclopaedia Britannica, is available upon request.

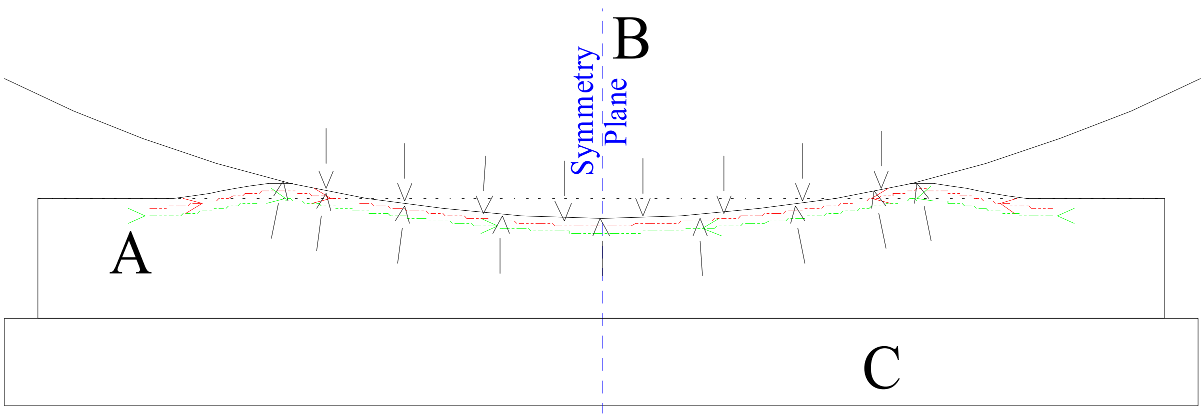
Magnets and magnetism related phenomena are acknowledged to be best studied and understood with the help of Quantum Mechanics, necessary at the atomic and the subatomic levels, where the granular nature of matter can no longer be ignored. As from the Relativity Theory onwards, modern science requires that an increasing number of Dimensions be considered, which are not easy for the human mind to grasp.

But for the layman it is enough a challenge to realize that in most technological fields, in-depth study of materials behaviour will involve several Variables which often interrelate with each other to some degree.

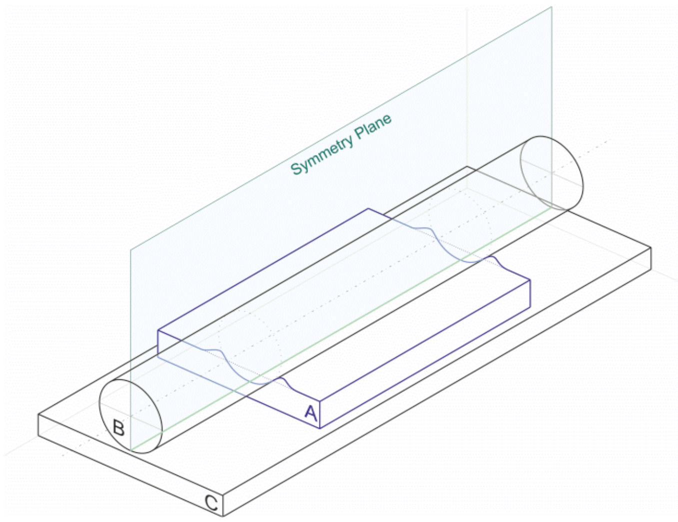
Basic steps as laid down by the Scientific Method remain unchanged, but organic-chemistry-based materials demand that a generous amount of time and database collection work be carried before any successful behaviour interpretation or further steps may be attempted. And as materials use chemical compounds closer to that common to living beings - such as natural rubber - observation and data base building times will tend to grow somehow, in a similar way to those required for bird watching observation, or scientific wild life study.

Compression Scheme and Rubber Reaction

Let us consider a uniform thickness, rectangle shaped, flat solid rubber format A seating on a horizontal flat steel block C. Solid rubber is incompressible but deformable. When a compressive force is vertically applied on the rubber surface by the descent of a steel cylinder B, exerted by an area segment of its lateral surface, rubber particles displaced due to local thickness reduction must reach a new equilibrium position and a *field of compressive plus tensile reaction force* develops.



The above image depicts a rather simplified variant of current offset printing conditions.



Steel cylinders' height is bigger than the width of rubber format A and both cylinder bases overhang from the rubber format A. The resulting frontier perimeter of the steel / rubber interface is composed by the two generatrix segments of the lateral cylinder surface - where the two bulges are formed in compensation of the rubber volume displaced by the cylinder - and completed by the two circumference segments of the rubber format lateral edges which are also in contact with the cylinder.

The steel/rubber frontier segments defined by the cylinder generatrix lines define an indentation compression condition, while the two circumference segments of the rubber format define a deflection compression condition.

The field of reaction forces created by the cylinder on its descent into the rubber block has a symmetry defined by the generatrix line of the cylinder that indents deeper into the rubber. We can say that line forms a *domain wall* and establishes a border between two distinct domains, the field of reaction forces of *each domain being just the mirror image of the other*.

Let us now assume that, keeping the same pressure on the rubber block, the cylinder is dragged leftwards, perpendicularly to its axis over the rubber block. (The cylinder is being slid instead of being rolled.) Some rubber particles, originally subject to the domain field of forces on the left side will have to sneak under the domain wall, joining now the domain field of forces on the right side.

As the particles change from one domain to the other they must adapt themselves to the varying stress conditions they are being submitted.

Changing a particle from one domain to another demands a certain amount of energy, meaning the particle will also have a correspondent reaction. As the domain wall moves sideways, the potential energy stored by that particle increases until it becomes big enough for the particle to sneak under the domain wall and to join the adjacent particles to which it is structurally linked but from which it had been brought apart by the initial descent of the domain wall.

When the particle finally changes its position from one domain to the other its reaction is quite sudden - usually acknowledged in the Printing Industry as Rebound, re-baptised here as **Whip Reaction** - and it may be sufficient to contribute to a very minute movement, that is usually described as rubber **Feed Properties**.

A number of factors and compression scheme variations influencing the rubber behaviour, namely in what concerns hysteresis, whip reaction and feeding properties are dealt as annexes to the present document.