



Renewable resources in roadworks. An alternative to the dominance of oil

Michel CHAPPAT

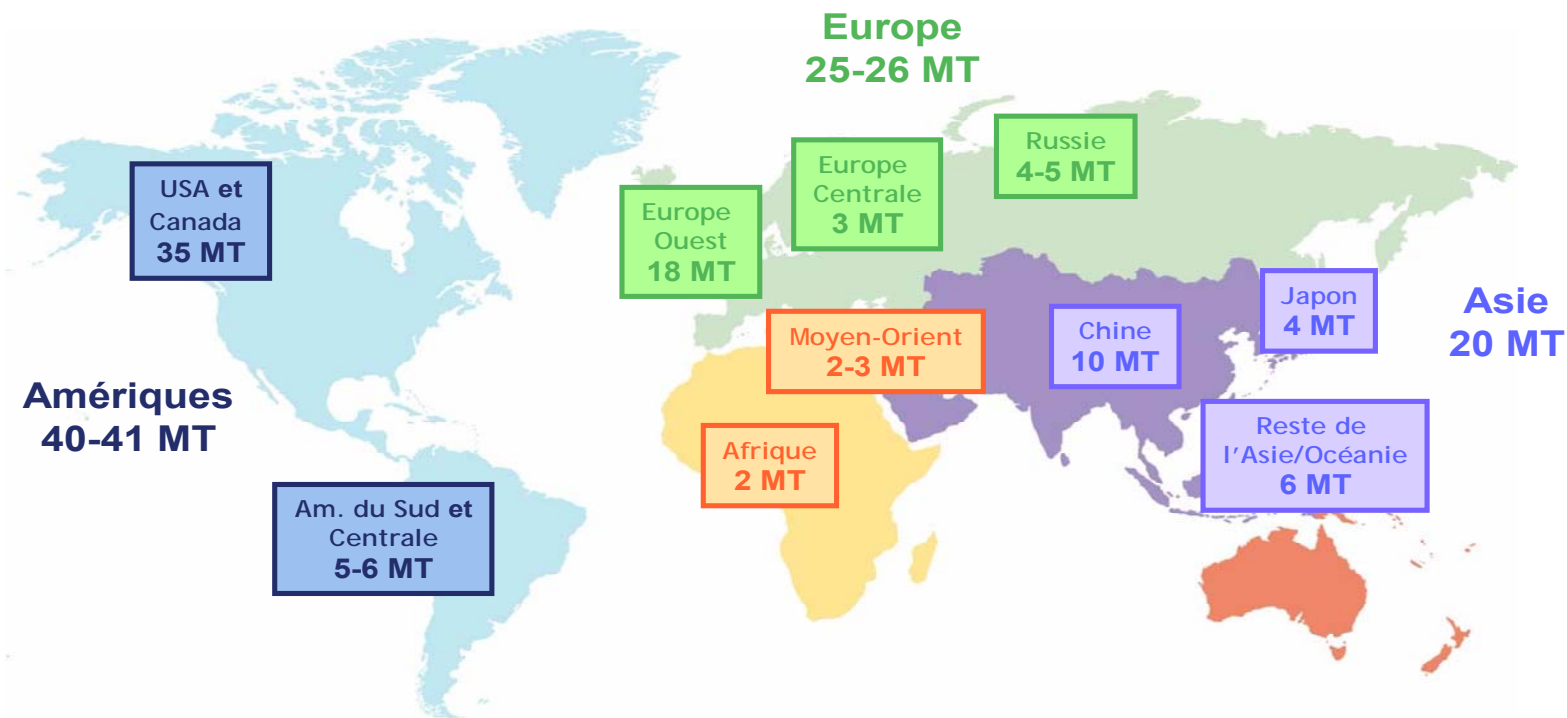
- COLAS SA
- Director of Research and Development
- chappat@siege.colas.fr



Global bitumen consumption: approximately 90 MT



La consommation mondiale de bitume :
environ 90 MT



Bitumen and fuels in the world of the road



Bituminous mixes in the world

United States *	500 MT	(30)
Canada *	40 MT	(2)
27 member European Union	320 MT	(18)
Rest of world	640 MT	(35)
Total	1500 MT	(85)

* Without recycling



Emulsions in the world

27 member European Union	2.65 MT
US / Canada	2.75 MT
Brazil	0.40 MT
Mexico	0.65 MT
Other countries in South America	0.50 MT
Rest of world	1.05 MT
Total	8 MT

Bilan : Bitume et carburants dans le monde de la route



Applications of emulsions

Road surfacings	Surface dressings	2.4 MT
	Cold microasphalt	0.8 MT
	Others	3.6 MT
Cold microasphalt		1.2 MT
Total		8 MT

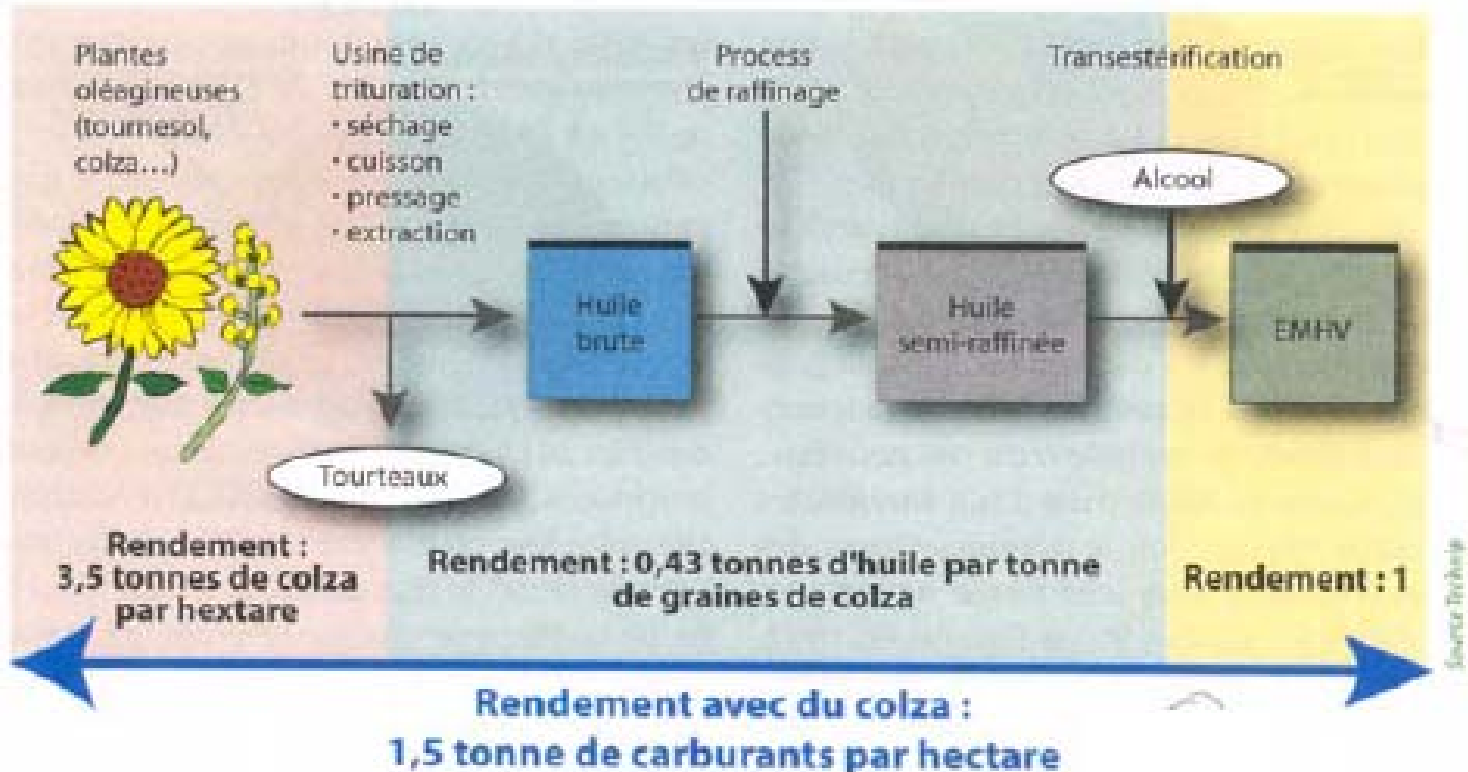


World fuel consumption

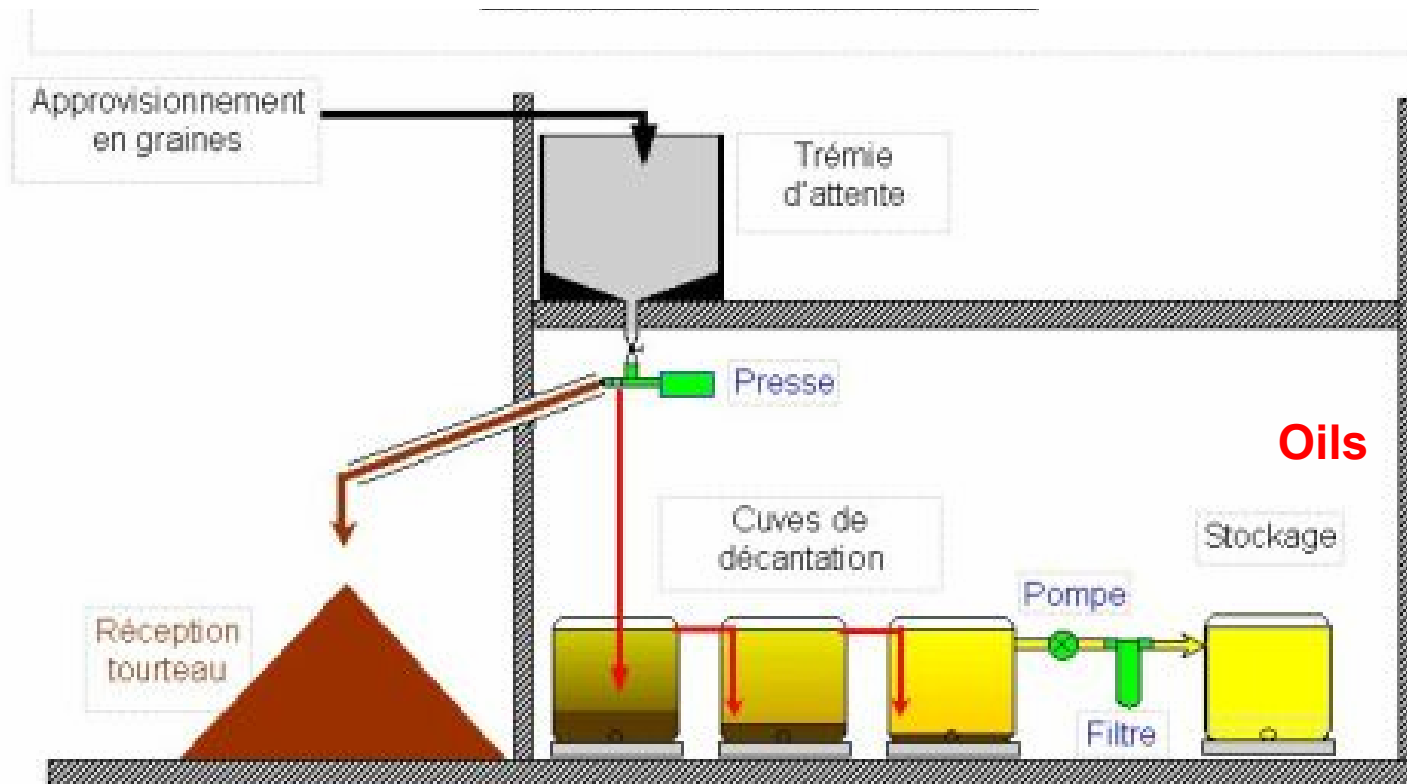
Machinery	6 MT
Coating	7.5 MT
Other	0.5 MT
Total	14 MT

La chaîne EMHV : un process en 3 étapes

Le procédé de production d'EMHV (ester méthylique d'huile végétale)

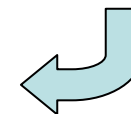


The manufacturing principle for vegetable fluxes



**Chemically modified
functionalized esters
(Vegeflux)**

← **Esters**



Replacing oil products



→ Rape seed



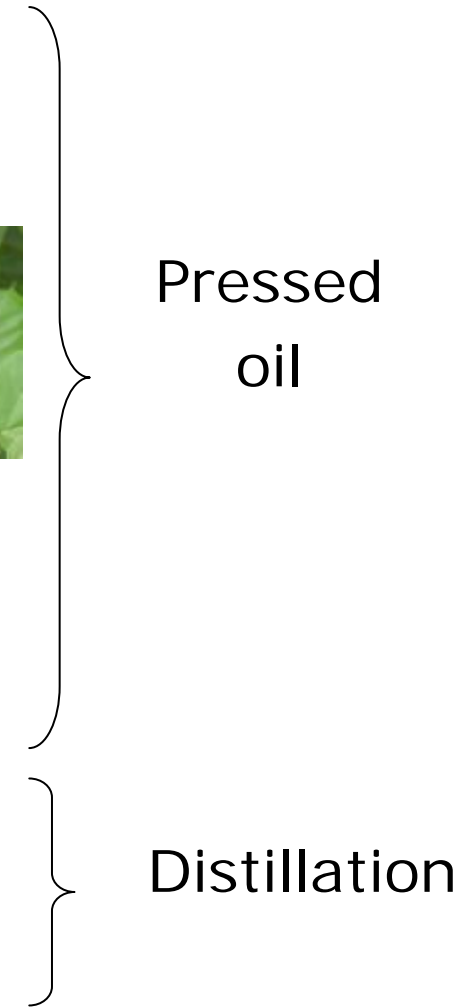
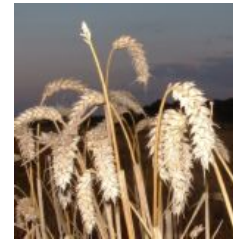
→ Jatropha



→ Sunflower



→ Wheat



Replacing oil products



Examples of yields



87 %



77 %



04 %

Oils

Alcohol

Important to note: 1 Ha → 1 tonne of oil → 1 usable tonne

Replacing oil products



Fluxes : 240,000 T → 240,000 Ha

Fuel : 14 MT → 14 M Ha

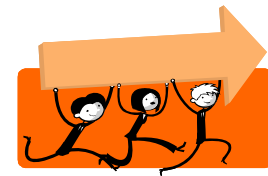


20% without modifying engines → 2.8 M Ha

3 M Ha

Will we have enough cultivable land?

To feed 8 billion people instead
of today's 6 billion



To live without oil?



The answer for France :

Replacing oil with agrofuels.

This would require 4 times the surface area of the country

IMPOSSIBLE

Impossible for most industrialized countries.



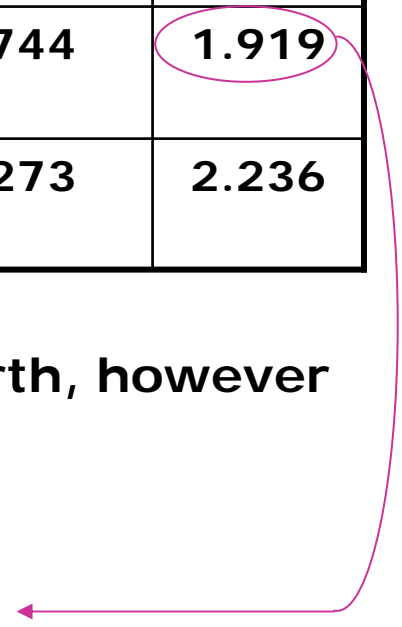
Production capacities

According to a UN report of 2004, global land usage breaks down as follows

In 10 ⁹ Ha	Total	Forests	Cultivated	Rest
So-called industrialized countries	5.383	1.720	1.744	1.919
So-called developing countries	7.658	2.149	3.273	2.236

In the north, however

- North America 0.081
- Russia 0.621
- Europe 0.070
- Other 0.347



- Our requirement of 3.10^6 Ha is acceptable.
- There is available land, particularly in developing countries
- In Europe, above all in new member countries.
- Progress with regard to yields provide hope.

A substitute for bitumen: Vegecol

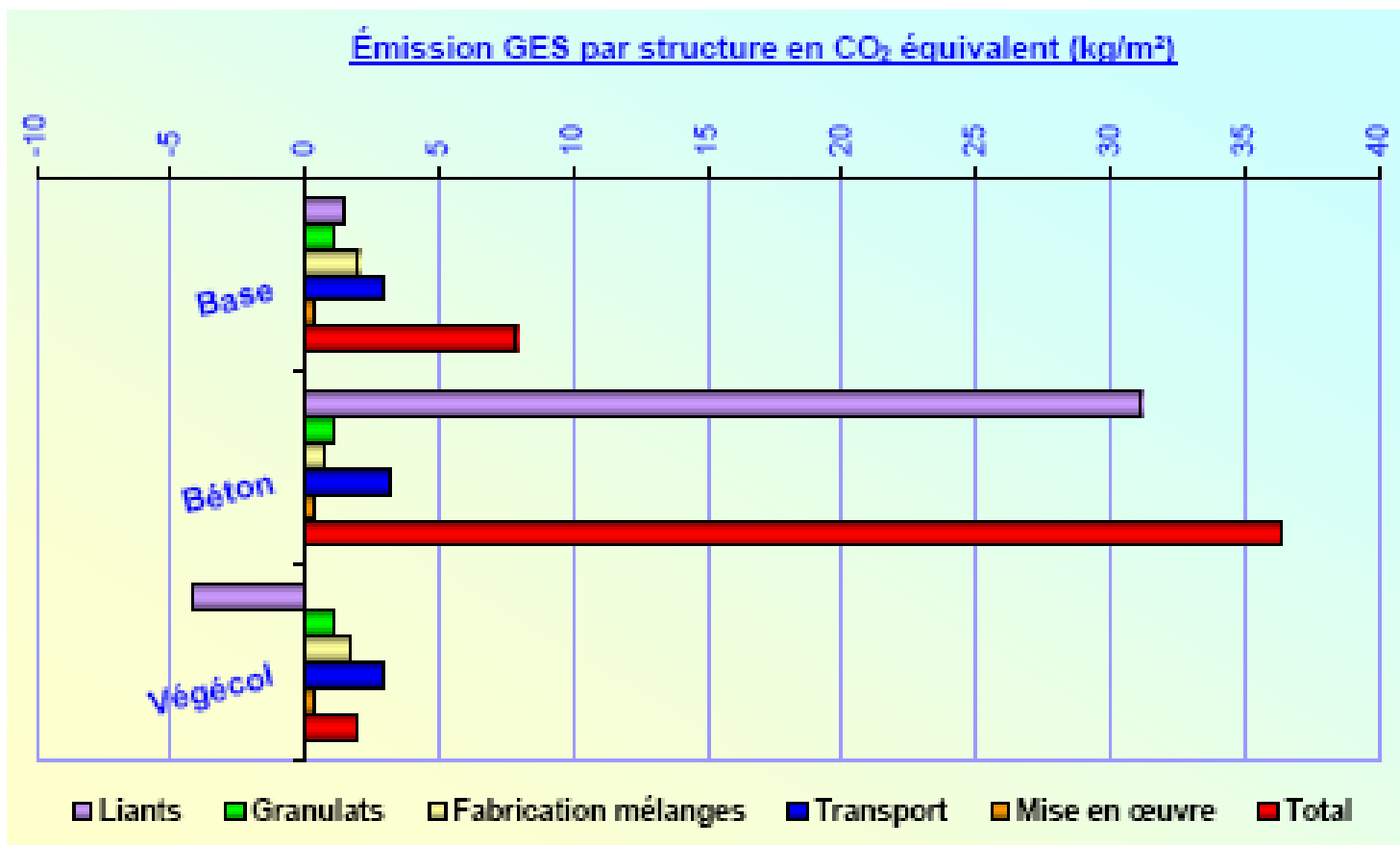
Resin + oil → Binder



The benefits

- Maximum temperature 130°C → 30 to 40°C reduction.
- Improved mechanical performance.
- Considerable reductions in GHG emissions

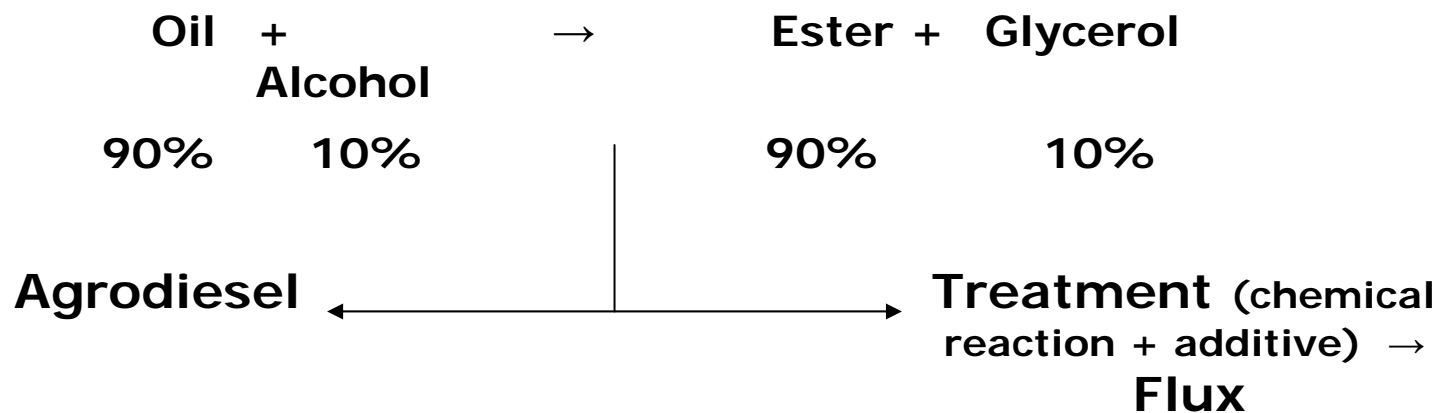
Audit: LCA for Vegecol



Applications in roads



A fluc for road surfacings.
A substitute agrofuel



Applications in roads



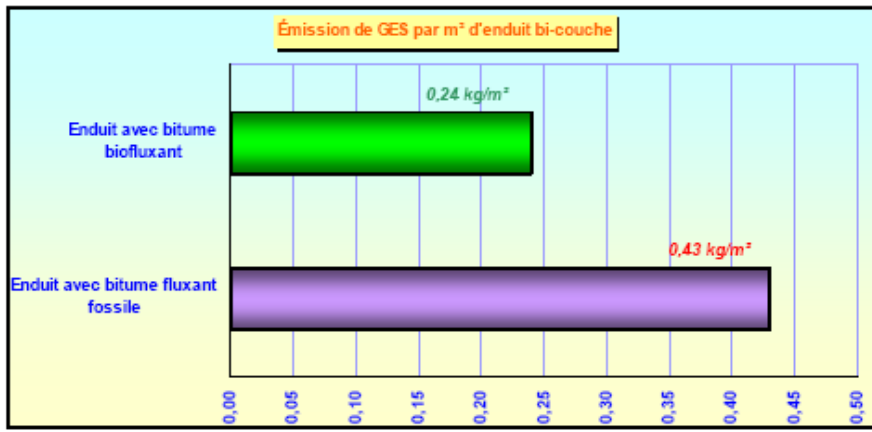
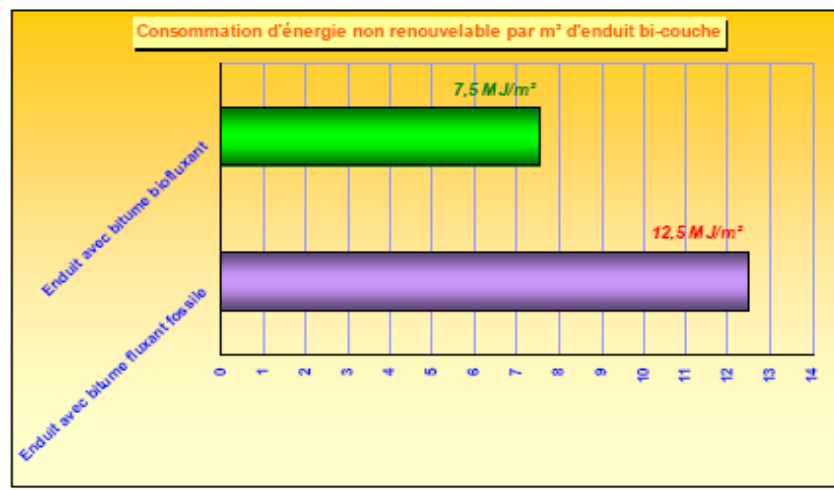
Audit for Végéflux

- un gain matière et donc une économie de ressource fossile supplémentaire de l'ordre de 5-10% de bitume
- un gain de température d'épandage des liants de l'ordre de 20°C et donc de l'énergie correspondante
- une économie de l'ordre de 30% de fluxant dans les mélanges

Convinced clients.

Development is slow in France, a country with longstanding traditions.

LCA for Vegeflux – 40% reduction



Other very political issues

- Deforestation ↔ Greenhouse effect
- Fertilizers ↔ G.M.O.
- The energy used to produce agrofuels

As far as we are concerned

- No risk of destroying major balances
- Exciting technical results
- Necessary to commit ourselves