



Acidification of Slurry with Sulfuric Acid

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The chemical industry has a historical opportunity to benefit:

By adding

SULFURIC ACID

to slurry...

The problem: Today in Europe



Tractor

Slurry

Disburse methods:

1. Air
2. Tubes

Ballast



PROBLEMS:

Ammonium emission – limiting fertiliser effect ❌

Granulate fertilizer needed = nitrogen leaching ❌

Air pollution from particles – causing health problems ❌

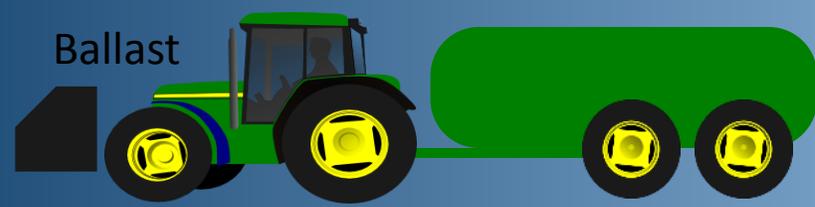
The problem: Today in Europe



Tractor

Slurry

Disburse methods:

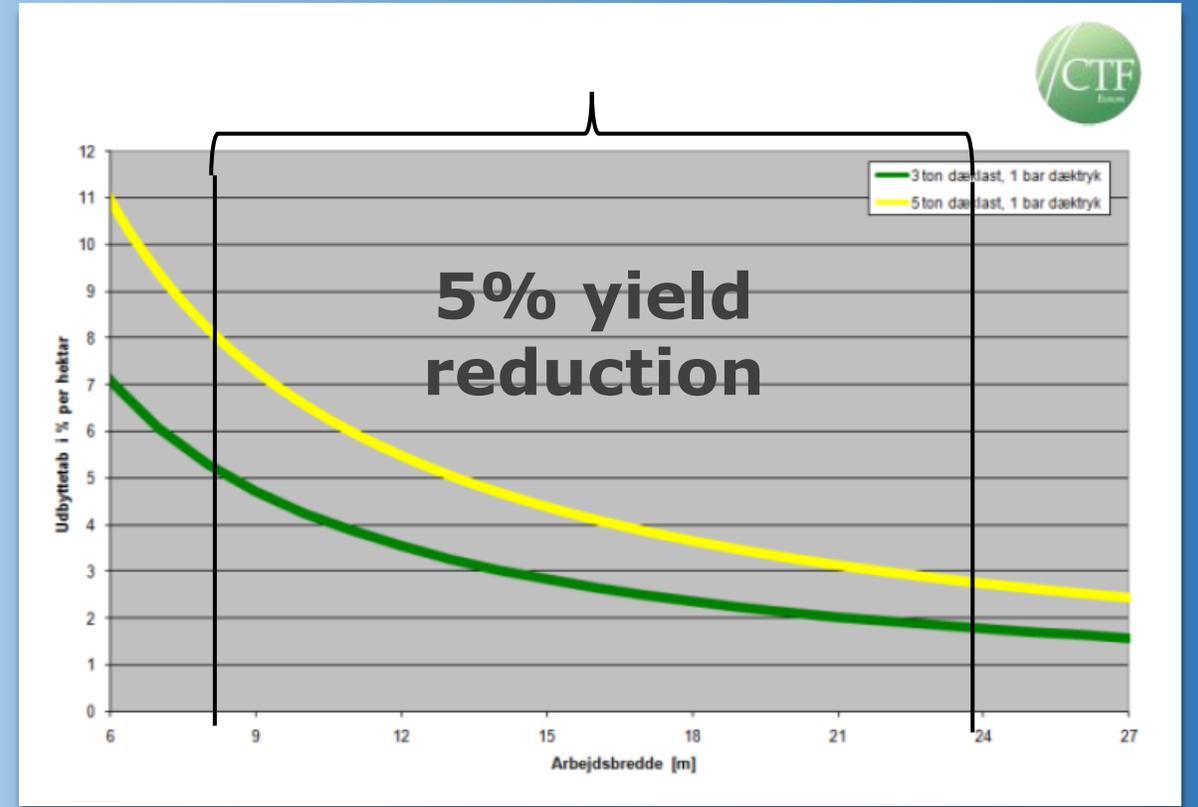


1. Air
2. Tubes
3. Injection



PROBLEMS:

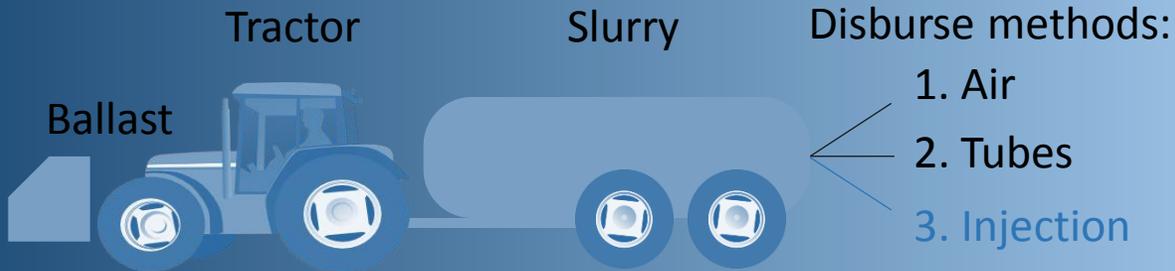
- Ammonium emission – limiting fertiliser effect ❌
- Granulate fertilizer needed = nitrogen leaching ❌
- Air pollution from particles – causing health problems ❌



A method to overcome the problems with air and tube disbursement of slurry

- Much shorter working with ❌
- More traffic: Causing CO2, costs and lower yield ❌
- Wear parts in soil and damage from dry root ❌

The problem: Today in Europe



PROBLEMS:

- Ammonium emission – limiting fertiliser effect ❌
- Granulate fertilizer needed = nitrogen leaching ❌
- Air pollution from particles – causing health problems ❌

The solution: Future in Europe



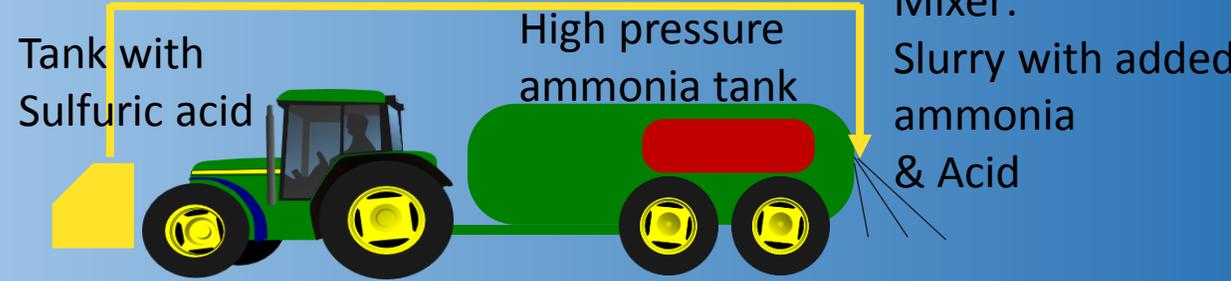
SOLUTION: SyreN

- Ammonium emission – reduced by 50% ✔️
- Air pollution from particles – significantly reduced ✔️
- Nitrogen leaching – reduced ✔️

This method has proved
Very high ROI

This method has proved
cost neutral

The solution: Future in Europe

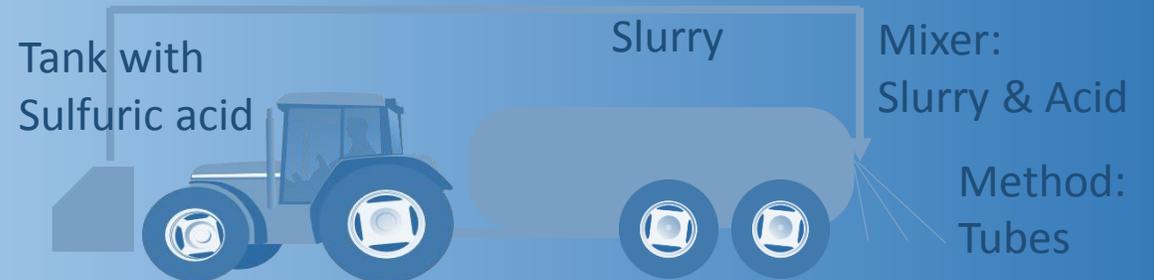


SOLUTION: SyreN +

Due to added ammonia the fertilizer is increased so no granular fertilizer is necessary ✓

Hence: Time, transport and traffic is reduced ✓

Significantly reduced nitrogen leaching ✓



SOLUTION: SyreN

Ammonium emission – reduced by 50% ✓

Air pollution from particles – significantly reduced ✓

Nitrogen leaching – reduced ✓

Potentially reducing **15 million** tons/year
of **CO₂** in Europe

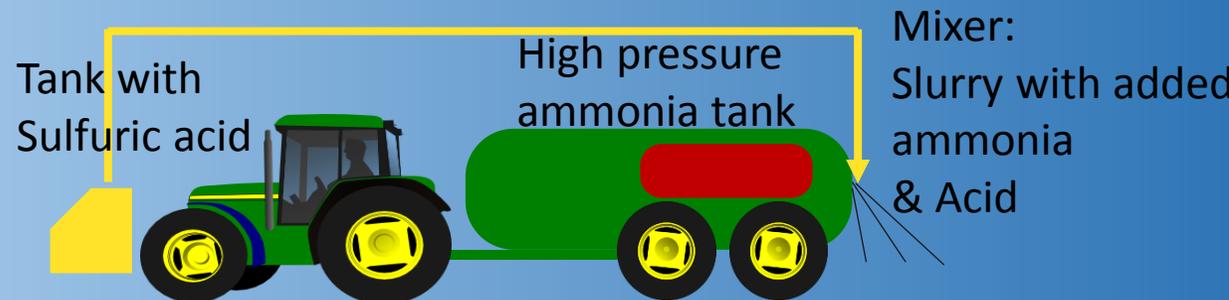


SyreN+ reduce CO₂ with 821 kilo/pr Ha

According to a survey done by Aarhus University

SyreN reduce CO₂ with 220 kilo/pr Ha

The solution: Future in Europe

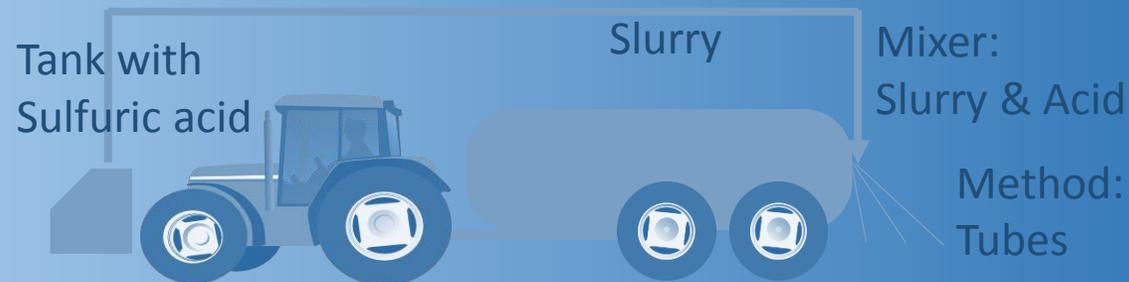


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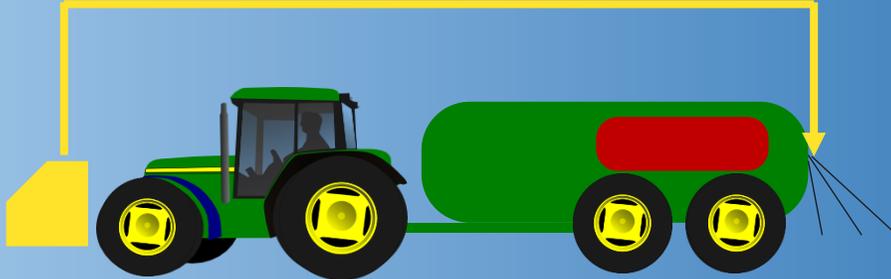
Air pollution from particles – significantly reduced ✓

Nitrogen leaching – reduced ✓

During the next 30 minutes...

I will explain how sulphuric acid has the potential of

Saving **11 Billion**
Euro/year of health-
related external cost



Saving **10.000**
premature
deaths/year

Reducing **500 000**
tons/year of
Ammonia emission

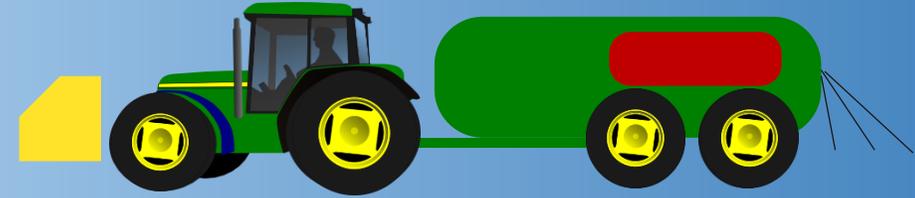
Reducing **200 000**
tons/year of nitrogen
leaching to ground water

Reducing **15 million**
tons/year of
CO₂

I know... that these are big numbers!

And I may be wrong!

Saving **11 Billion**
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Reducing **200 000**
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leaching to ground water

Reducing **15 million**
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CO₂

I know... that these are big numbers!

And I may be wrong! As others have been before me...



1943

“I think there is a world market for maybe five computers.”

--Thomas Watson, chairman of IBM



2007

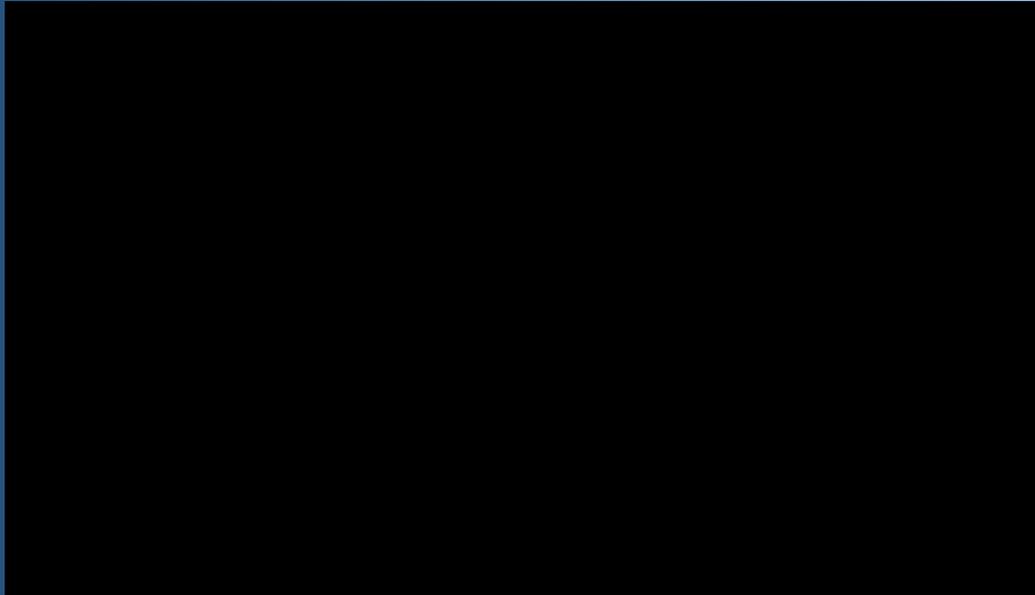
“There’s no chance that the iPhone is going to get any significant market share.

No chance.”

--Steve Ballmer, CEO Microsoft

To convince you I will spend 3 out of 30 minutes

Presenting a short movie on the solution



- pH value is lowered to a level with no evaporation
- No damage to nitrogen sensitive nature
- 50% emission reduction
- Ammonia transformed into ammonium
- And a good fertilizer
- If iron sulphate is added – smell is reduced
- Live data and documentation is part of the system
- Win-win: For contractors, farmers, environment
- 40% of particle pollution originates from ammonia (DK)
- Profitable and sustainable production

1

How it works

2

Test results

3

Problems with the present situation

4

Future benefits

5

What are we waiting for?

1

How it works

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What are we waiting for?

pH value is decisive for NH_3 (ammonia) or NH_4^+ (ammonium)

NH_3 emission kilo N ha⁻¹



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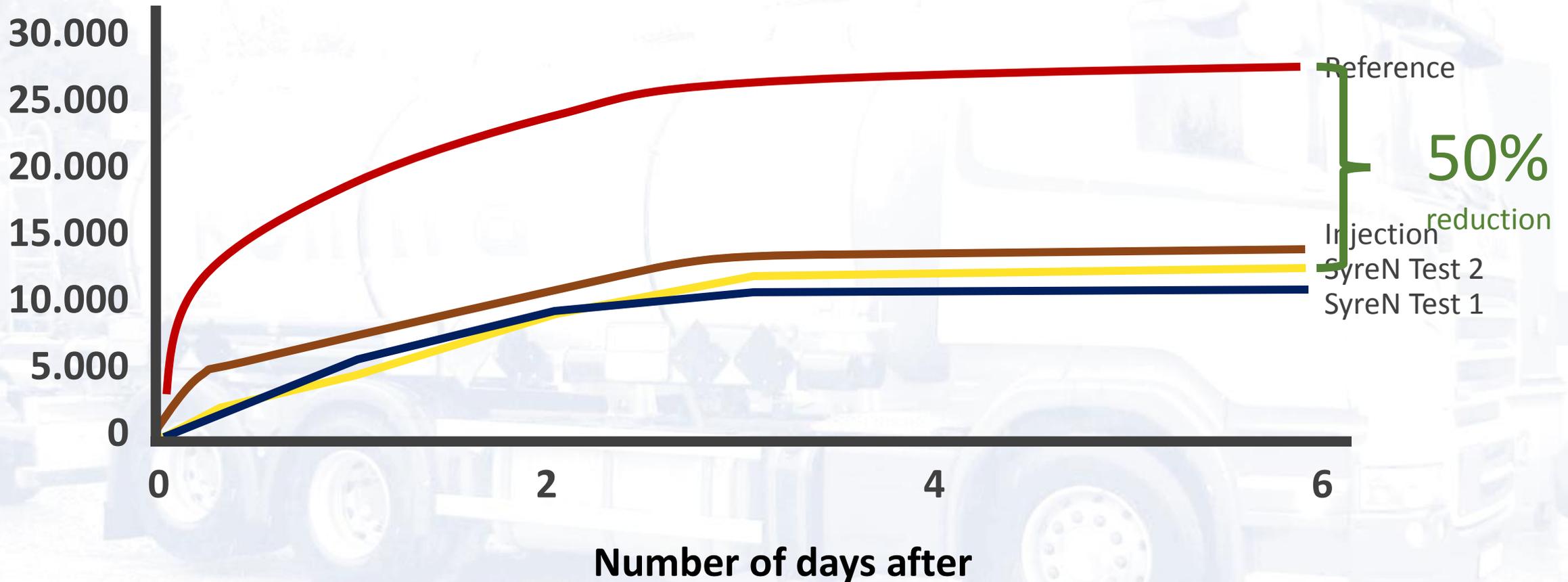
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What are we waiting for?

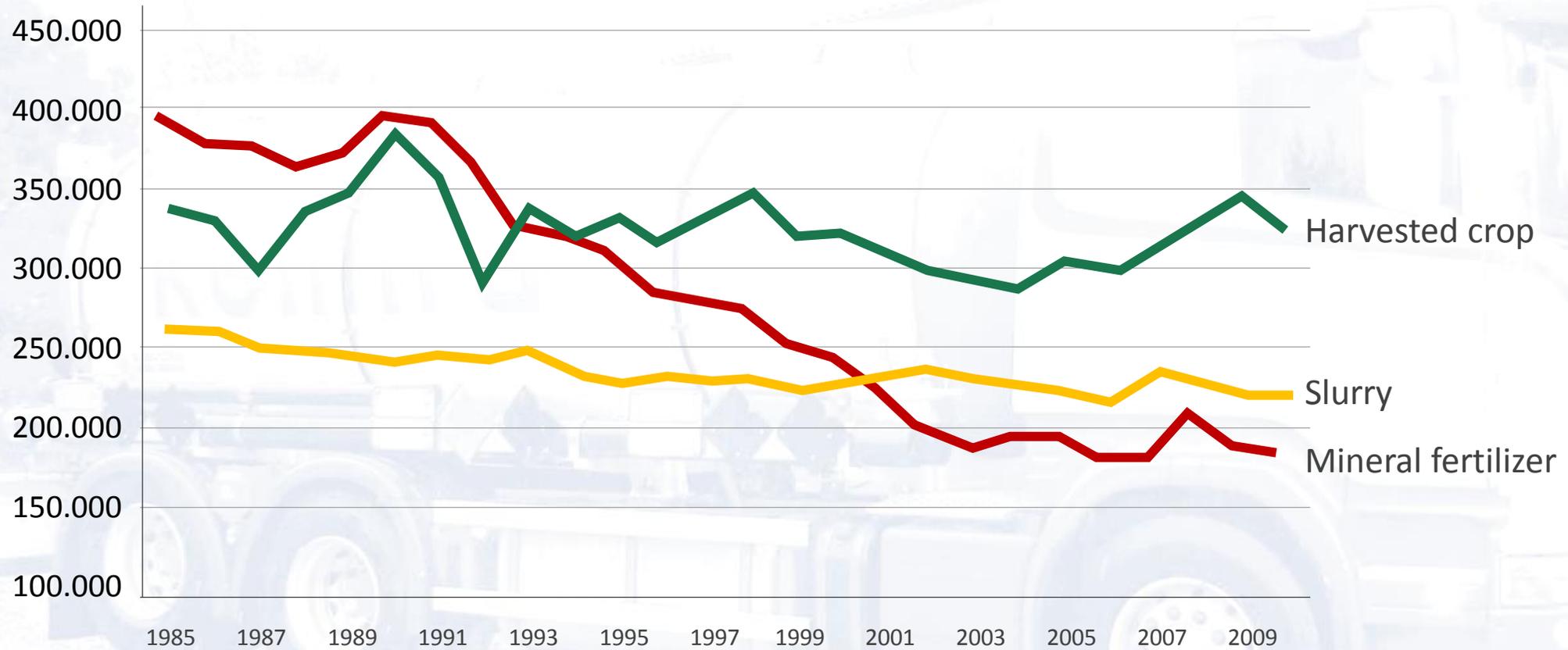
Casestudy June 15th 2010

Accumulated ammonia emission after distribution of cowslurry on grass

N loss g/ha



Denmark have the strictest environmental legislation in the world - Danish farmers have learnt to utilize the slurry better the hard way!



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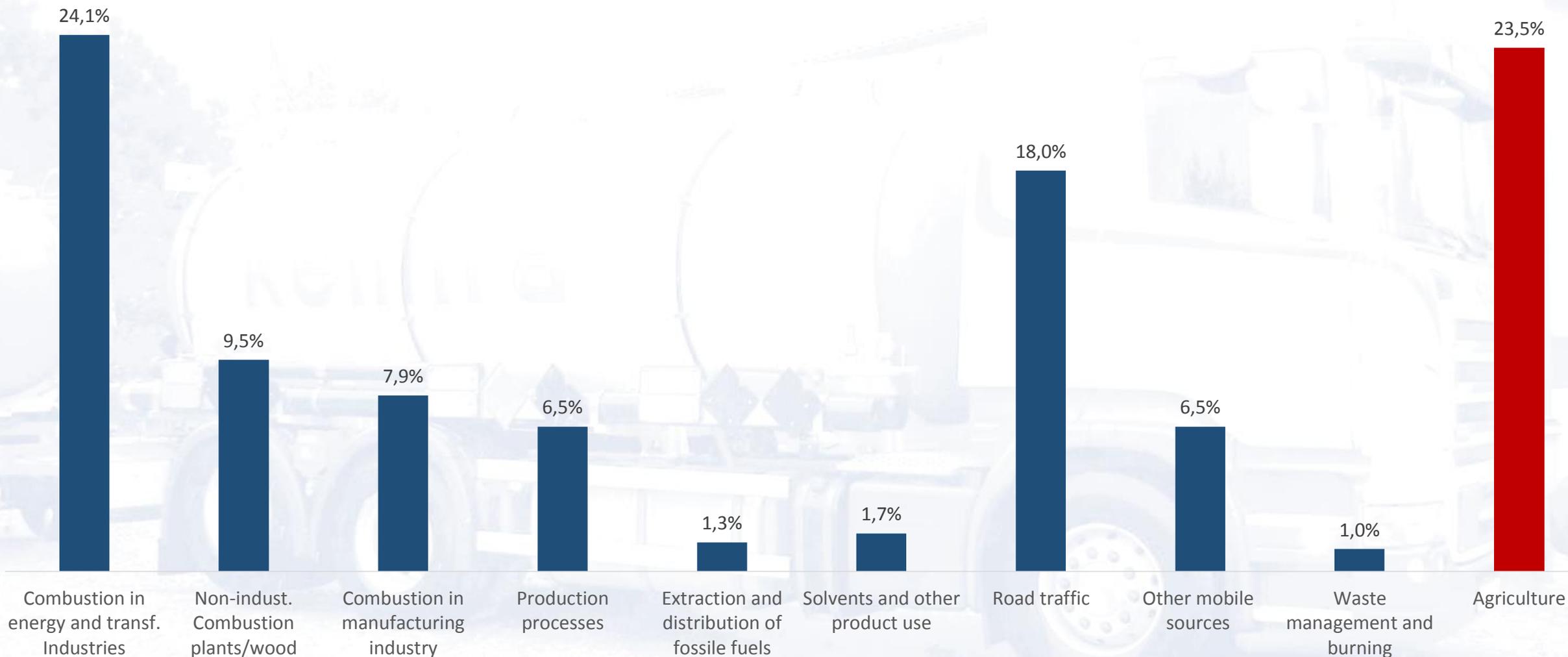
What are we waiting for?

Air particle pollution

– causing 450.000-680.000 premature deaths every year

■ EU

Health related costs from air pollution 766 billion EURO



Source: CEEH Scientific Report, + J. Brandt et al...

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How it works

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What are we waiting for?

Benefits:

1. Better yield
2. Less nitrogen leaching



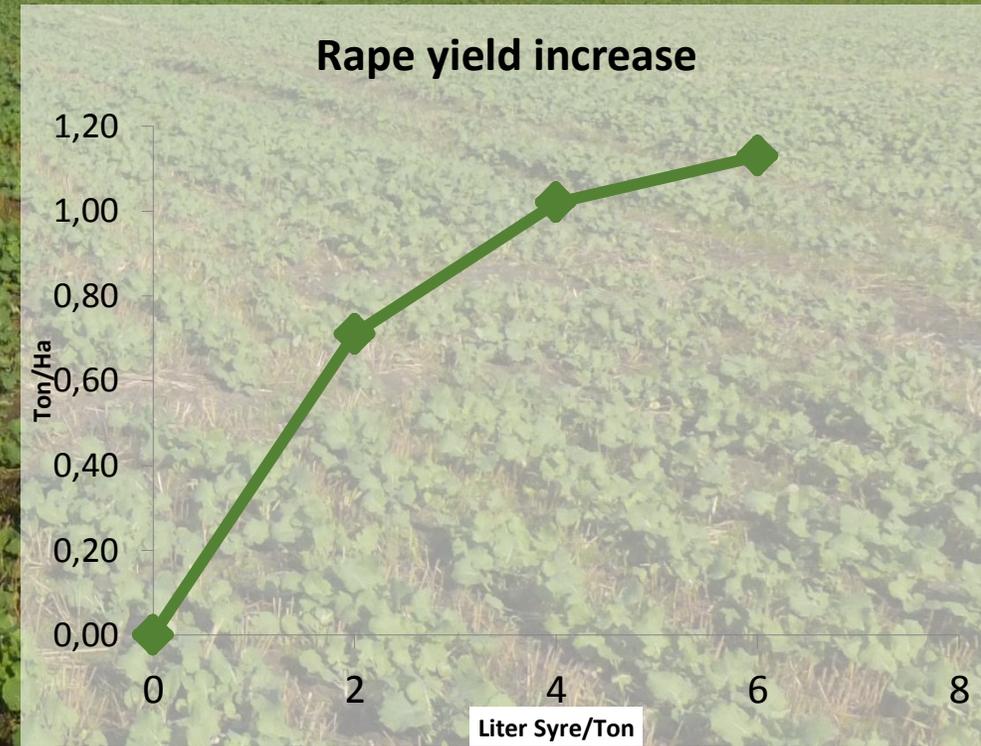
Rape – 25 m3 swine slurry



Rape – 25 m3 swine slurry + 5 liter acid

YES!

It is the same field
No PhotoShop



Benefits:

1. Better yield
2. Less nitrogen leaching

“

Replacement of nitrate with ammonium nitrogen reduces average leaching of nitrogen with 3 kg / ha pr. year”

“

“Use of nitrogen inhibitor :
Reduces average leaching of nitrogen
with 9 kg / ha pr. year
With Mais”

Source: Center for agriculture, Denmark



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What are we waiting for?

In Denmark – legislation and incentives are in place

17.3% of total amount of slurry is acidified

	Number of units	m3 slurry
Stable acidification:		
Infarm	110 systems	900.000 m3
Hyldegaard staldservice	15 systems	100.000 m3
Tank acidification:		
Harsø	35 systems	1.200.000 m3
Ørum	30 systems	1.000.000 m3
Field acidification:		
SyrenN	86 systems	2.000.000 m3
Total amount		5.200.000 m3

But Denmark is just the beginning

The chemical industry has a historical opportunity to benefit

Health

Environment

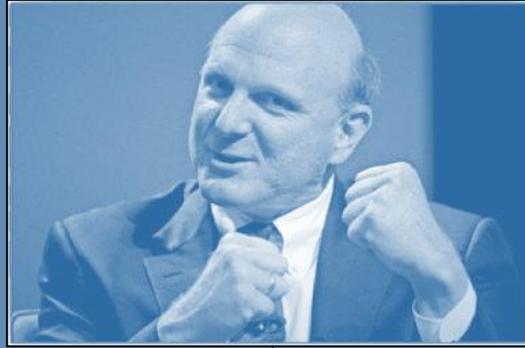
Farmers

Acid manufactures

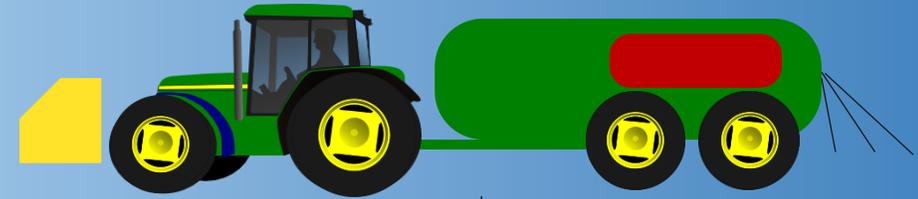
I know... that these are big numbers!



1943



2007



2013

Theoretical total market in EUROPE:
1,2 billion tons Slurry:

50% is acidified ->600,000 Tons slurry

X

1-2 ltr Sulfuric Acid / tons slurry

=

1-2 million tons Sulfuric Acid