What is your opinion about the main opportunities with lignin in asphalt?

Mentimeter

Reducing GHG emissions

Proposing alternatives

Lowering content of non-renewable components

All opportunities described today are possible and have high potential

The industry needs help to find a good option to be able to use lignin as a fluid instead of a powder in order to replace bitumen 1:1. Please but some effort on that.

No better bio-based & low environmental impact alternative. Oil companies not very interested in shipping around the low quality part of crude oil (=bitumen)

decarbonization of the road paving industry while anticipating reduced supply of bitumen if crude oil extraction and therefore bitumen is reducing

what is acid lignin? How is it different from kraft and hydrolysis lignin?

Lignin has good opertunities to become one of the components for an 100% biobased binder

23

What is your opinion about the main opportunities with lignin in asphalt?

Mentimeter

Improving high temperature performance

Possible alternative to fossil source

Reducing GHG and environmental impact

Interesting material as replacement as binder. only material available globally in quantities to replace Bitumen with reduced emissions.

It is a good opportunity to reduce GHG emissions

Reduce reliance on fossil fuel derived bitumen

Reduction of CO2 emissions and better use of lignin

Al the results , lab tests and asphalt pilots have proven that lignin has a future on the asphalt level

Using lignine is a start to go 100% bio based.

23

What is your opinion about the main opportunities with lignin in asphalt?

Mentimeter

reduce the amount of bitumen in conventional asphalt

Biogenic carbon

Material with immense potential due to possible availability in bulk quantity

Depends on replacement of fossil sources.

Interesting but complicated

Opportunity to reduce emission

Great oppertunities 100% Biobased binder

We need to achieve environmental goals and lignin could be one answer to that

Is our customer ready to pay for it?

23

What is your opinion about the main opportunities with lignin in asphalt?

Mentimeter

Reduce the climate footprint while maintening or exceeding the performance.

Avoid importing from Russia

Climatneutral 2030

acceptance by pavement industry

23

What is the most important driving force to make this happen?

Mentimeter

- Regulation changes
- regulations
- Become less dependent on fossil sources
- Green tenders
- Durability in use needs to be shown
- Requirements of the customer side.
- Market
- LCA and standards evolutions
- Road owners willingness to allow and encourage the use of lignin

20

What is the most important driving force to make this happen?

Mentimeter

Government and authorities must support the change. the entire risk cannot lie at asphalt plants

regulation and public funding adjustments to pull the market to m

Reducing lignin production costs

Co2 reduction, reduction of fossil raw materials

2030 and 2050 goals

Availability, price, FUNCTION, recyclability, regulations. Ease of use.

We need to do something to stop the climate change.

Introduce in construction tenders

industrialisation, prices

20

What is the most important driving force to make this happen?

Mentimeter

Find a way to have lignin not in dust

Regulations, cost

find a unique selling point. At the moment, lignin is less cost-effective and LCA shows it's more complex. Other than that, performance might be a way in.

Climat neutral 2030

Reducing fossil sources.

Finding an aswer to the dropping quality of bitumen

As an bio-oil consiting of lignin

new Specification/ regulations to come inforce. cost & performance will play huge force, comparing with existing bitumen roads.

Decarbonization targets by bitumen producers

20

What is the most important driving force to make this happen?

Mentimeter

A high bitumen price...

20

Do you see the limited lignin supply as challenge and is the fact that there is no marketplace for lignin today a problem?

Mentimeter

Yes

No

I think it is a question of market demand in the long run. Production and marketplaces will develop once market acceptance comes

I don't see that as a problem

When the market ask for more lignin the producers will produce and offer more.

Lignin production increase should follow the increased use of lignin. Harmonization needed?

If industry was willing to pay higher price, lignin would be produced in larger quantities

Lignin as a product today cannot outpreform bitumen in terms of function or ease of use. We need to find a way to make lignin into an oil and then work on the formulation to get a good replacement.

No.

22

Do you see the limited lignin supply as challenge and is the fact that there is no marketplace for lignin today a problem?

Mentimeter

yes, will include Quality and sustainable supply.

No

yes

Price is of interest, so yes!

No

No. It will be a matter of time that the maket will fill the gap between demant and supply.

it is a challenge. No future competition with fuel

Too soon to answer. Not during the development phase

No market is not a problem, the issue in my view is in the transportation / handling at blending site, and processing LARGE scale of lignin

22

Do you see the limited lignin supply as challenge and is the fact that there is no marketplace for lignin today a problem?

Mentimeter

availability in required price range

As demands go up, the supply goes up.

no. Industries using lignin are slower to transform than production to ramp up

Yes, but can be overcome I think

Too early yet

Demand-supply price point is the issue

no. Will be difficult. only regulations could help

difficult to know. the long term behaviour and rate of reclaimed asphalt need to be more investigated

22

Do you believe there is/could be a “green premium” to get & how should a “green premium” be organized in your opinion?

Mentimeter

Not in the short term

Premium for what?

Depends on the jurisdiction

need to do full analysis considering the higher temperature / time required for mixing

Unfortunately, it is not in sight in the near future.

A sustainability premium organized by authorities

Yes, there need to be in order to compete with other high value applications

Main goal of road owners is to pay less and have better performance, so no

No. The value could be something that increase the value but then the ease of use needs to be better. A best practice to use it as an oil instead. Today its not something people would pay more for.

Do you believe there is/could be a “green premium” to get & how should a “green premium” be organized in your opinion?

Mentimeter

It would be better with increased tax/penalty for coal and crude oil products.

Yes government bodies should set the biobased standard in tenders en enhance these developments.

Incentives will come from carbon taxes

Don't see there is really a market demand for it. The market will go for the cheapest permitted product. So, legislation need to drive the demand for lower emissions and make sure it's not "greenwashed".

ideally, no green premium over the long termon the short term, everybody is actually expecting to pay a premium for the transition, but then it should end up lignin-based asphalt being cheaper than bitumen based

It could be a driver. But allocation/standards are very important here

Yes the roadowners schould promotie this

Authorities should penalize the low environment performance of the status-quo, then alternatives can get a premium

Development costs money.

14

What is a relevant and realistic substitution level - short term and long term?

Mentimeter

20%

10 -20%

Substitution based on making at least carbon neutral binder

30% short term - 100% long term

10% ST, 30% LT

Short term: ~15%. Long term: 100% (as a part of a biogenic oil). That needs to be disclosed to the market.

100 % Biobased binder with lignin

Depanding in witch country you live.

st 20%lt 50% (probably needs components beyond lignin)

19

What is a relevant and realistic substitution level - short term and long term?

Mentimeter

ST=20 % and LT=40%

10 % short term and 20-25% long term.

short term at least 30% long term 50% to 100% if all the biobased ingredients are available in quantities necessary.

Whatever gives the maximum incentive e.g. in form of carbon credits or bonuses to reach carbon neutrality

ST: up to 20% to build knowledge and experience with the productLT: up to 100% depending on the requirements of the road and application

Quality is more important than %

Depends alot on the type of mix. Probably around 20% ST. LT hopefully more

Up to 50% LT

Anything below 100% is not interesting in the long run :-)

19

What is a relevant and realistic substitution level - short term and long term?

Mentimeter

Depends on progress with recycling of old asphalt. more recycling probably gives less room for lignin (harder bitumen)

there is not enough Lignin to subsitue 100% of bitumen WW or did I miss something?

Relevant is the demand of "green"products "by the goverment. Short term, the governments should stop working only with big companys

With lignin as today perhaps max 20%, a further developed product combination have to be higher.

50% has been proven possible.

19

How much lignin is needed to substitute bitumen on a relevant substitution level in the different countries represented today?

Mentimeter

125.000 ton

honestly no idea !?!?!?

1 000 000 tn

at 20% we need 20 million T Globally and at 50%- its 50 million Ton Globally

In France, we use about 2 Mt/year of bitumen

I think Estonian annual consumption is ~100kta -> 20kta of lignin needed for 20% replacement

Canada would require 250,000 tonnes at 10% substitution 45% penetration rate

~1 MT- 1,5 MT each year is used (bitumen) for the roadmarket. How much that would translate to into lignin is hard to answer.

1.4 Mtons for Europe

10

How much lignin is needed to substitute bitumen on a relevant substitution level in the different countries represented today?

Mentimeter

Estonia uses annually ~100000 ton of bitumen.

~1,0 - 1,5MT for the nordic countries

Local authorities

10

Your opinion about the main hurdles to make this happen & the main technical/practical challenges?

Mentimeter

Dry powder

price

Long term performance

Regulation

value in the performance ; addition in powder form and higher viscosity if added to bitumen

Logistics and dosing. They play significant role in the price as well

Low temperature performance

The problem is that this is a new field. The knowledge from you guys would help the industry to start using the commodity. We need to use the lignin as an oil not a powder. Please research and recomend oils to be used.

Quality evaluation, as a binder

Your opinion about the main hurdles to make this happen & the main technical/practical challenges?

Mentimeter

Price

Properties of lignin, cohesiveness, low T performance

Not all of lignin is soluble in common solvents. How can you prove how much is put in the mix?

Customers' attitudes must be changed in a greener direction.

acceptance by main stream contact companies and road owners.

Packaging to keep dry

Regulations and performance

Performance like bitumen roads, cost, handling large scale productions, and Meeting specification.

main hurdle = costs; main challenge = transporting million of tons of lignin can not take place in trucks, or you simply kill the CO2 benefit, so a solution for export in barge is needed

Your opinion about the main hurdles to make this happen & the main technical/practical challenges?

Mentimeter

Recyclability

to define the "quality" of lignin suitable for certain / all kind of mix

Price goes hand in hand with quality. The more you research the easier it is for the market

The main hurdle is government behaviour and regulations. Technical and pratical the asphaltindustrie (MKB in Nederland) are ready for it

Time. Because time is need to monitor and get infoirmation the move on to the next lavel.

Performance

price point and performance implications. If standard asphalt is cheaper and performs better, the GHG emission argument is not of interest (unless enforced by legislations)

Transportation

Resiliance, future failures jeopardize good research

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Do you miss any actors along the value chain? What actors do you miss?

Mentimeter

bio oil manufactorers.

Transporters!

More involvement of actors in legislation

Government

More lignin manufacturing in industrial scale. More local supply

Authorities (= the ones that actually define the road building projects and their requirements/demands)

Bitumen producers

How to make it work like a binder?

Policy makers

14

Do you miss any actors along the value chain? What actors do you miss?

Mentimeter

Are all lignin useable for all markets? More emphasis on technical specifications.

Fundamental properties that are important for roadowners?

smaller companies

Law scholars and public authorities

Insurance ? :)

smells good!

Road owners

Less smell

It is not the number of actors., but the way they act.

14

Do you miss any actors along the value chain? What actors do you miss?

Mentimeter

willing the share info

Consultants, they are conservative!

Local administration

14

What would be the most important “happening” to really make this happen – that lignin becomes a standard substitution in asphalt.

Mentimeter

- Increase price of bitumen
- Proof of outstanding performance!
- "Cheaper" than conventional asphalt in green tenders
- Data gathering.
- Face out of fossil resources
- A proof of function 1:1. In that case the price needs to be inline with "normal" bitumen.
- Progress on view regarding LCA, EPD, ECI, etc.
- enforced by legislation (use x amount of lignin in asphalt)
- government giving assets owners to buld x% of new roads with reduced CO2 footprint

19

What would be the most important "happening" to really make this happen – that lignin becomes a standard substitution in asphalt.

Mentimeter

Any government authority to give acceptance for lignin as 1:1 bitumen replacement

clearity of researchers in sharing all their valuable information without bias.

No other high value application for lignin

High price of bitumen

In the case of the presentations where lignin did not dissolve 100%. There needs to be work done from the lignin industry to help out.

Data on LCA, performance, cost analysis and research results

Compatibility of lignin with bitumen standards

Decision to stop mining oil

compulsion to use biomaterials in Roads.

19

What would be the most important "happening" to really make this happen – that lignin becomes a standard substitution in asphalt.

Mentimeter

It has the proof itself the be the solution.

Proven livetime after monitoring

Hydrophilic

Proof of sustainability

19

Do you see differences for the lignin application in asphalt in various climates? What differences?

Mentimeter

The fact that lignin is hydrophilic could be a problem. Water in Asphalt is usually a bad sign :-)

At the moment no very good lab test available to predict asphalt low temperature performance

for sure not for north europe and north america

Low temperature limitations, so any cold climate will have to limit the amount of lignin unless using additives

No , de asphalt mixture wil be different

Better in countries where it won't freeze

Yes. Low temperture behavior.

Not really, recipies need to be adjusted not the material.

freeze/thaw cycles. heavy rain events (aquaplaning). Use of vehicles (studded tyres), etc.

15

Do you see differences for the lignin application in asphalt in various climates? What differences?

Mentimeter

Stiffness is "bad" in cold areas

The introduction of lignine doesn't change the fact that each region has it's one best performing mixure.

Different mixture types. Different climates.

No differences. The characteristics of the 100% bio-binder can be made specific for different climates

Today we use different bitumen for different climates... why would lignin be a difference?

Nice participation from different parts of the value-chain!

less impact from different climate than from different public bodies incentives

Compatibility with polymers and possibility of making cold mixes?

Finally: What are your thoughts about this virtual workshop?

Mentimeter

Excellent experience!

very informative

Very informative. Very well presented and organised.

Good Presentation. well organised.

Maybe longer presentations? More in-depth discussion. Otherwise a great event!

Is was a interessting workshop Good presentations

I like the Mentimeter function. Its easier to list the questions. Well organised.

Good workshop, a lot of valuable information was shared.

Good job this was nice!

Finally: What are your thoughts about this virtual workshop?

Mentimeter

Interesting to see similar results from different perspective

very insightful to have so many different actors (researchers, but also industry)

Nice participation from different part of the value-chain!

well organized

very good and very interested.Few results about performance at both binder and mix scale

Menti is fun but follow up is hard

Very good workshop. PErhpas we should do this specific for governments to help them in making future proof choices

really appreciated the knowledge sharing, but it's too much like a "hard download". Would have appreciated to be able to interact more

It's nice to see that the use of Lignin is investigated all over the place.

20

Finally: What are your thoughts about this virtual workshop?

Mentimeter

mentimeter is good, hopefully you summarize in the followup

Extremely interesting and brings people with different realities together. It foster the possible discussions using different approaches

Very good workshop with good and interesting presentations

Would not participate if It was with a travel

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