WP4 : RA processing and management at the mixing plant

task 4.1 :Milling operation: possible influence on gradation and aggregate properties

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Task 4.1 : Production of RA

➢ **Framework, purpose**
Study of the Influence of cold milling on gradation and physical properties of reclaimed asphalts

➢ **State-of-art**
Description of the milling operation and the main parameters influencing the properties of RA

➢ **Experiments & result**
- milling jobs monitoring
- Laboratory tests and sample analysis

=> comparison of materials cored and milled
to highlight influence of milling

➢ **Framework, purpose**

WP41

- Important aging road network,
  => high quantities of RA
  => control characteristics of RA
  => controlling milling characteristics

(short) description of milling operation:
- organisation of the passes
- milling (here, semi-trailer loaded by the rear)
- sweeping

crawlers

Cutting tools: teeth

sweeping

Control of the upper layer

parameters influencing the properties of RA

Millings parameters (numerous)

➔ road (structure, material, layers),

➔ milling machine (model, power)

➔ milling operation itself

- milling width and depth of passes

- cooling water flow

- drum speed rotation

- machine forward speed

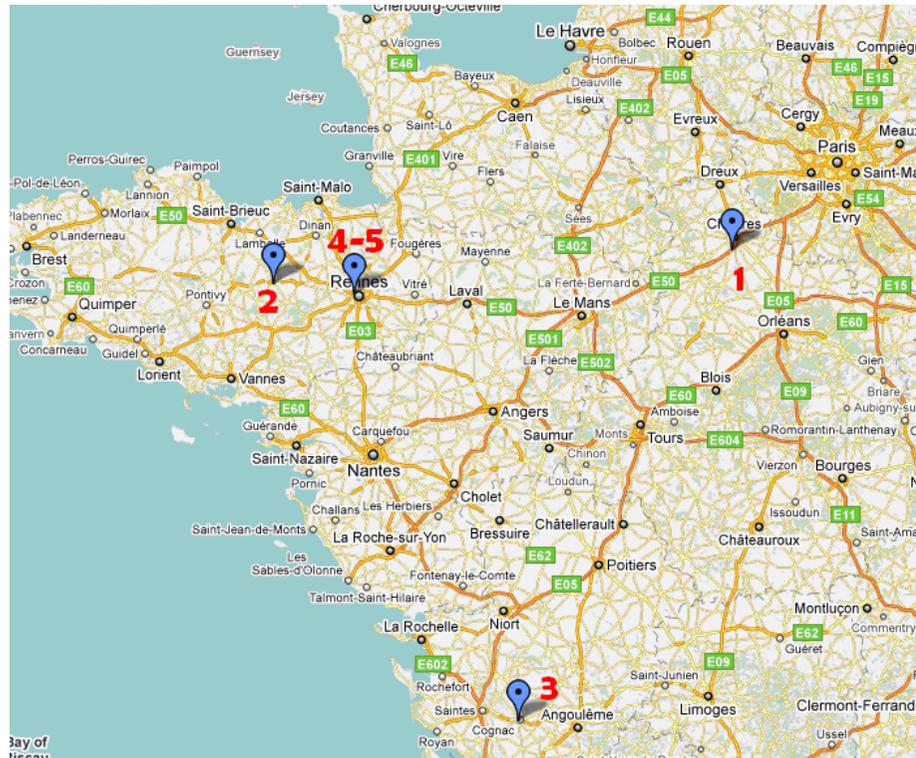- quality and wear of tools ...

Aggregates properties

due to Fragmentation and atrition, modification of :

- grading curves,

- finer aggregates creation

- flakiness index

- angularity and roughness

opportunity to monitor several milling jobs

- A11 close to Chartres
- RN164 close to Rennes
- RN141 close to Cognac
- RN12 : 2 zones close to Rennes

samples cored before the milling operations
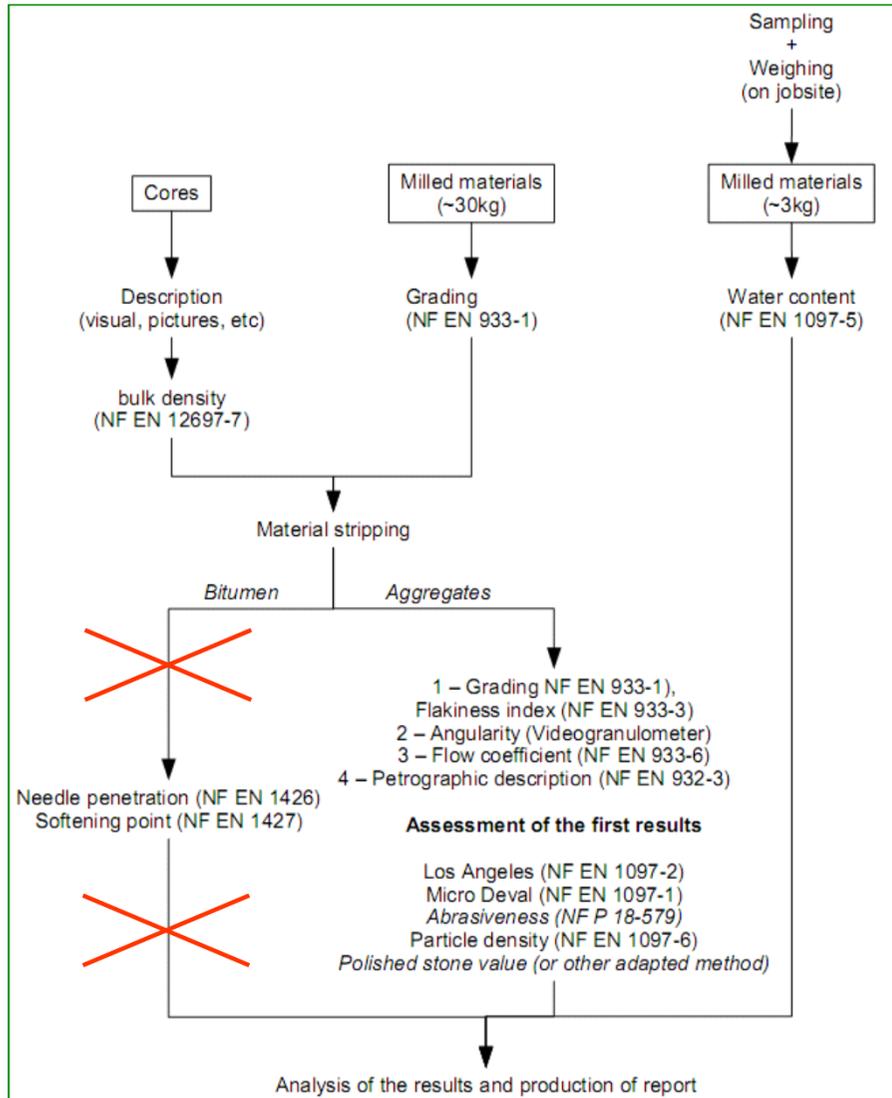milled materials taken after milling operation

Some milling parameter were modified
      ➔ influence of milling parameters on the characteristics of samples !

Sampling
+
Weighing
(on jobsite)

Cores

Milled materials
(~30kg)

Milled materials
(~3kg)

Description
(visual, pictures, etc)

Grading
(NF EN 933-1)

Water content
(NF EN 1097-5)

bulk density
(NF EN 12697-7)

Material stripping

Bitumen

Aggregates

1 – Grading NF EN 933-1),
Flakiness index (NF EN 933-3)
2 – Angularity (Videogranulometer)
3 – Flow coefficient (NF EN 933-6)
4 – Petrographic description (NF EN 932-3)

Needle penetration (NF EN 1426)
Softening point (NF EN 1427)

Assessment of the first results

Los Angeles (NF EN 1097-2)
Micro Deval (NF EN 1097-1)
Abrasiveness (NF P 18-579)
Particle density (NF EN 1097-6)
Polished stone value (or other adapted method)

Analysis of the results and production of report

main parameters studied

- forward speed
- hydraulic pressure
- water flow
- milling depth

one example of analysis

the range and value of parameters should remain
acceptable for the driver !

Modality	Measured mean speed (m/min)	Mean hydraulic pressure (bars)	Water flow	Actual milling depth (cm)	Samples (RA)	RA flakiness index (%)	RA water content (%)
1	8.3	145	Medium	-19	P1	10	5.1
2	7.3	145	Low	-19	P2	12	6.1
3	10.4	185	Medium	-19	P3	13	6.7
4	7.5	185	Low	-19	P4	10	8.0
5	9.3	110	Medium	-16	P5	11	5.4
6	6.3	110	Low	-16	P6	10	4.7

➢ Conclusions (see deliverable 4.3)

influence of milling parameters

the influence of parameters is difficult to assess :
the number of studied cases is limited, ranges of parameters were also limited

studies on site are difficult ➔

general trends

- grading curves are modified, finer aggregates, production of fine particles

- flakiness index did not show significant evolution, neither angularity …

Practical conclusions :

- presently the focus is set upon organisational questions, as discomfort of user, cutting tool preservation…and not on aggregate preservation

- milling parameters are partly optimized …

➔ thanks to the ears of the driver