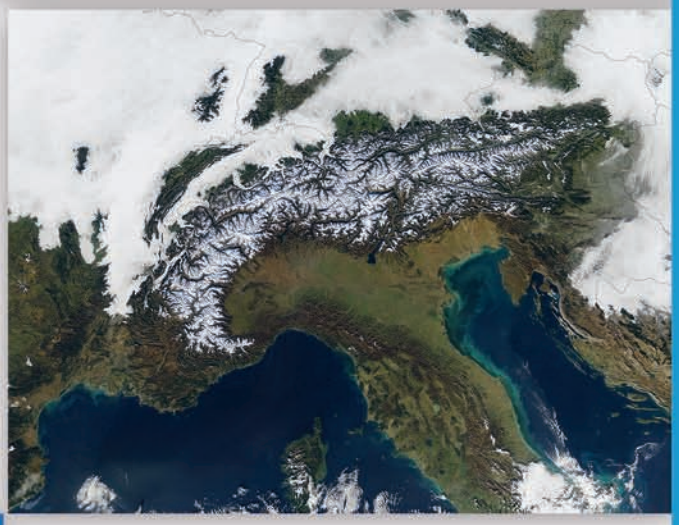
Newsletter No.32
April 2019

Rincent ND Applications

> Rincent ND Applications, a specialist in non-destructive testing, and Rincent Alpes, have carried out non-destructive dynamic tests on existing anchoring rods on the tie beam of a cabin cableway support tower in the Mont Blanc massif.
The investigation focused on:
> the length of the elements
> the dynamic stiffness, related to the inertia of the element tested in its environment and to the existing tension force.

The tests implemented consist of:
> to vibrate the anchoring rod with an impact caused in the direction of its axis; this impact is caused by a hammer equipped with a force sensor,
> to record the vibration V of the anchoring rod using a speed sensor fixed on the support plate,
> to analyze the Speed / Force curve as a function of the frequency after a mathematical treatment of these signals.



The equipment is semi-annually audited as per the test standard.
The analysis of the curve focuses on:
> the frequency response,
> the value of the dynamic stiffness.
The frequency response allows the calculation of:
> the total length of the anchoring rod
> in some configurations the "free" length,
> or other singularities.

Dynamic stiffness is the modulus of a complex number which is inversely proportional to the slope at the origin of the V / F curve as a function of frequency.
The stiffness characterizes the operation of the anchoring rod.

The work of Rincent Laboratoires on the determination of efforts in the anchoring rods from dynamic stiffness® is the result of a theoretical research that resulted in the filing of an international patent. The tests carried out for more than 20 years constitute a strong experience in the field, however a database is totally insufficient to interpret these tests.

Newsletter

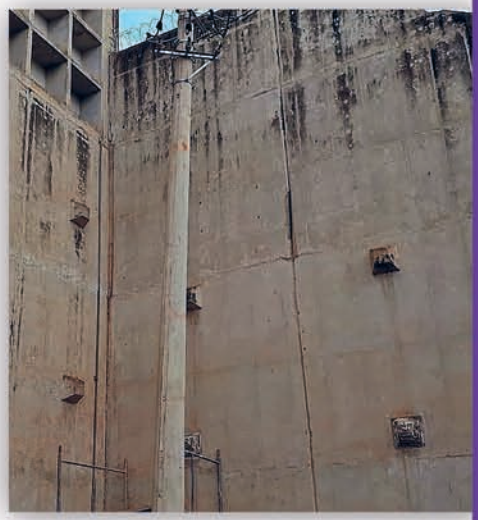
Brazil

> A recent intervention on a site in southern Brazil shows the consistency of the values of tensile forces obtained from the vibration analysis tests with the values deduced from the calculation of earth pressure on the retaining wall (photo attached).

Earth pressure calculation	From the dynamic stiffness	
	Column 1	Column 2
13,54t	12,88t	13,83t
23,35t	26,40t	22,79t

The interpretation of the non-destructive testing is improved when it relies on static tests performed in conjunction with dynamic tests.

The tests on the anchoring rods are adapted to semi-infinite massifs.



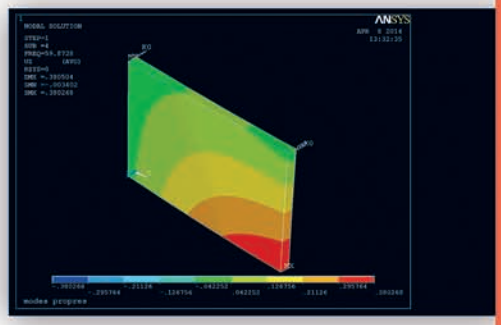
Agencies

> The Rincent Nord-Pas-de-Calais agency associated with Rincent ND Applications have performed a diagnosis of the quality of the fastenings of 42 facade cladding panels of a building.
Altogether 236 points were tested.
These tests consist of:
> to emit a pulse shock using a hammer equipped with a force sensor,
> to record, the vibratory response of the panels,
> after mathematical processing of the signals obtained, to analyze the curve V/F, result of the test, as a function of the frequency.

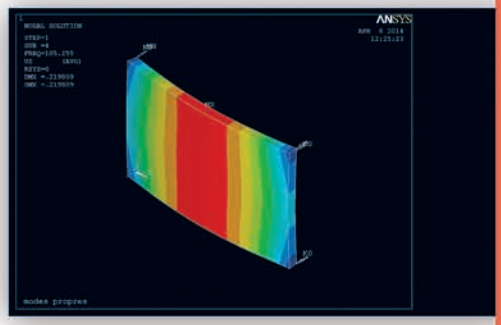
The "singular" points are highlighted by a high signal amplitude, associated with a low stiffness.

The analysis results in the examples of joined reports, with a color scale based on the calculated stiffness values.

Plaque 32			Plaque 33		
1	2	3	1	2	3
4,08E+07	3,22E+07	5,51E+07	1,90E+09	2,34E+09	1,66E+09
1,22E-05	7,03E-06	7,81E-06	6,14E-07	3,81E-07	6,44E-07
4	5	6	4	5	6
2,50E+07	4,16E+07	2,64E+07	3,54E+07	1,16E+08	3,29E+08
3,10E-06	4,39E-06	4,40E-06	2,44E-06	2,66E-06	2,06E-06



see the animation



see the animation

Newsletter

Rincent Air

> Two measurement campaigns were carried out to characterize the initial state of the air quality in the environment of the Eiffel Tower renovation project.

Rincent AIR installed sensors of:
> nitrogen dioxide,
> benzene,
> dust
on 20 measuring points spread over the area.
Whatever the pollutant measured, high values are reached in the areas of traffic congestion, for example near the bridges.
The lowest concentrations are measured in or near parks where traffic is predominantly pedestrian. These results highlight the influence of road traffic on the air quality in the study area.

Rincent Air intervened in a regulatory context that requires the project owners to carry out an environmental impact sassessment for any project having an impact on the environment or health (article L122-1 of the Environment Code).
The reports are real regulatory files.

Agencies

> The common duct for pressure tight Boiler called 3Cep, is a vertical and collective combustion products evacuation system allowing the connection of several individual condensing boilers to a sealed combustion circuit.

After laying the ducts, the companies perform a smoke test as a self-test. After the laying, the phases of dressing of the columns can generate duct breaks.

Rincent Laboratories agency of Bretagne carries out these measures of tightness before connecting the boilers to the duct.

These measurements are coupled to a smoke test. In case of proven leakage, a precise location can be made using an endoscopic camera.

www.rincent-bretagne.fr

Agencies

> The Rincent Nord-Pas-de-Calais agency intervened on a parking project in Colmar. It was to perform a tensile test on piles whose function is to take up the pushing forces induced by the water during the rise of the water table.
The test load was monitored by a calibrated load cell.
To be noted in the foreground of the photograph, the presence of a pumping well that allows lowering the water table.
The efforts generated by the horizontal water pressure are quickly very important. For example, a parking lot of 5,000m² under a hydraulic load of one-meter-high water leads to a horizontal pressure of 5,000 tons.

Agencies

> The NF EN 16907-4 standard deals with the soil improvement using lime and / or hydraulic binders.
This part 4 of the standard has more than 100 pages and develops procedures related to the different types of materials defined in part 2 of the same standard.
The Rincent Ile de France Nord agency carries out soil improvement studies in laboratory and monitors the works of in place soils improvement.
The laboratory tests first identify the materials to be improved. Then, standardized tests are performed to evaluate the suitability of these materials to the improvement.
Most commonly it is with lime and cement that soils are treated. It is a question of obtaining mechanical characteristics compatible with the requirements of the building site. For example, obtaining an Immediate Bearing Index which guarantees the movement of the machines on the site is one of the first requirements, followed by the mechanical characteristics of the treated material.
These tests are supplemented by volumetric swelling measurements which must remain below the limits indicated in the soils treatment standard.
The final choice of the type of treatment takes into account the economic constraints related for example to the cost of the binder and the daily cost of stopping an earthworks site.
When carrying out the works, the control may be performed on the water content of the soil to be treated, the quantity of applied binder, see the attached photo of weighing and the bearing capacity of the platforms.

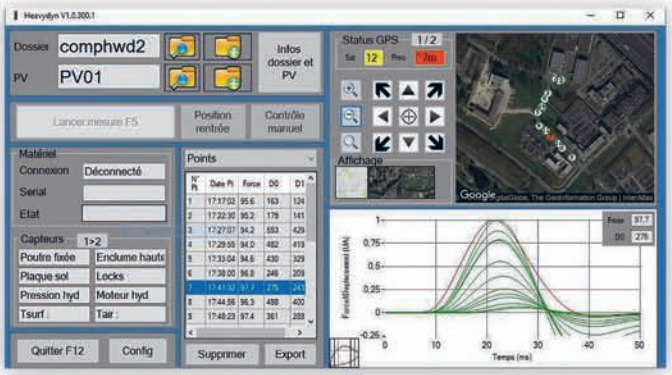
www.rincent-iledefrance-nord.fr

Newsletter

Rincent Airports

> Rincent Airports has performed deflection measurements with a FWD (Falling Weight Deflectometer), on highway A570 on a 6.5km long section, (PACA Region).
The 280 measurements were carried out at night using a FWD type deflectometer (Falling Weight Deflectometer).
These tests measure the deformation of the pavement subjected to a dynamic load simulating the passage of a 13-tonne axle.

Nine geophone sensors, arranged at different distances from the axis of application of the load, make it possible to obtain <deformation basins> and to calculate the elasticity modulus of the different layers of the tested roadway.



The FWD is manufactured by Rincent ND Technologies and calibrated by a COFRAC laboratory.
Accurate geolocation and Rincent ND Technologies software for the transfer and retrieval of measurements facilitate the reports preparation.

This equipment sold in 2018 in the United Kingdom was accredited by the competent body during a test session that brought together about fifteen equipment.

www.rincentlaboratoires.fr/airports

Congo DRC

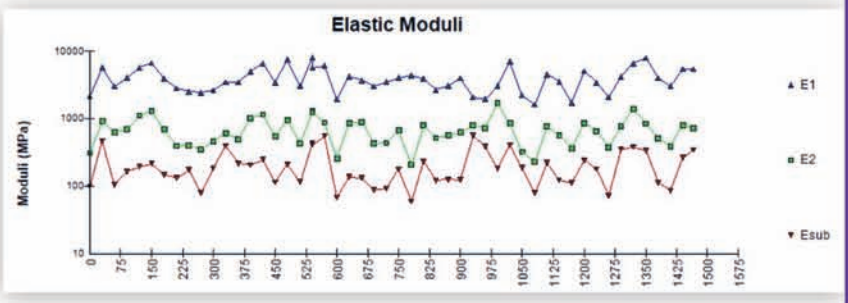
> Rincent ND Technologies has completed a training of technicians and engineers of the Congolese Agency of Great Works in Kinshasa. This training is related to the handling of materials:

> GPR Radar
> FWD, Falling Weight Deflectometer
> Minidyn LWD, light weight dynaplaque
> IRI, laser profilometer

The first 3 materials are manufactured by Rincent ND Technologies.

Note that these trainings can be done in French, English, Portuguese and Spanish by engineers having the practice of tests and their interpretation.

Congo DRC



> Part of the training was on the retro-calculation which makes it possible to convert the measured deflections into elastic modulus for each of the layers composing the roadway.

The data necessary to perform a retro-calculation are:

> deflections and loads of each test FWD / HWD,
> pavement thicknesses, (from core samples and / or GPR data),
> asphalt temperatures.

It is an iterative process performed by specific software.
For example, at São Luis airport in Brazil, a retro-calculation was performed from the data:
> of deflections,
> the types and thicknesses of materials determined from geotechnical surveys,
> the temperature of the asphalt at the time of the tests.

The modulus of asphalt changes with the temperature. It is recalculated for a temperature of 25 °.
This retro-calculation made it possible to obtain the modulus of the different layers composing the roadway, (chart attached).

Senegal

> The ICA - ITECH - RINCENT BTP SERVICES - ROAD & D group has been working since mid-2018 on the development of a road reinforcement guide for AGEROUTE in Senegal.
The principles of the approach are based on in situ investigations, mainly pavement surveys that will lead to an assessment of the existing roadway and its need for reinforcement.
The rational method proposed is based on the French standard method adapted to the context of Senegal by taking into account existing local recommendations and references.
The main input parameters are:
> truck traffic characteristics: axle load, traffic intensity and aggressiveness,
> the characteristics of the roadway to be reinforced and its foundation. This information is the result of a prior testing program,
> the economic parameters of road policy such as the level of service, the maintenance cycles, etc,
> the usual reinforcement techniques.

The first step is to analyze the state of the art in Senegal from the available elements, such as the existing reinforcement studies, the traffic studies, the behavior of the pavements in service.
On the ground, sections of roadways representative of the degraded routes of the road network will be chosen and examined. The analysis of the results will make it possible to model the structures in place and to calculate the reinforcement necessary to satisfy the fixed criteria.

This process will lead to the development of a method of reinforcements design and classification of road sections in terms of required works.
The assignment is planned over a period of 20 months.

Newsletter

Brazil

> The attached photos show a deep foundation element of 250mm in diameter at the time of the first tests and the same foundation after excavation.

The theoretical length of this foundation is 7 meters, that deduced from the mechanical impedance tests is 2.7 meters for a plane waves propagation velocity of 3500 m / s and 3.2 meters for 4000 m/s.

The mobility of the vibratory response is abnormally high. The dynamic stiffness is abnormally weak.
These elements coming from the analysis of the vibratory response led the Rincent agency of Recife in North East of Brazil to alert the control office and the client about these non-compliant results. Hence, these investigations revealing a defect of concrete.

Concrete provides continuity of propagation of waves and this type of non-conformity is difficult to detect with the echo method which only uses the propagation of plane waves.

Myanmar

> Rincent Research Expertise has been working in Myanmar to participate in the development of a methodology for reinforcing a raft by injection.

After on-site analysis, the reinforcement methodology was defined jointly with the contractor to reduce the identified risks.

Rwanda

> The Government of Uganda through a national water-specific company, is building a water treatment plant in Katosi and storage facilities in Nsumba. Both sites are located on the shores of Lake Victoria in Ntenjeru County.
These sites are located about 50 km from the capital Kampala. This is to supply water to the population of the capital, currently of about 2 million inhabitants and which will be 4.5 million in 2025. The started works must be completed in 2021.
The production of drinking water will reach 120,000 cubic meters per day.
Rincent BTP Rwanda performed:
> pressuremeter tests up to 25-meters deep,
> determined modulus, limit pressures and creep pressures of soils.

These elements made it possible to establish a G2 type report in accordance with standard NF P 94-500.
The objective was to design the foundations of the structures of the projected works.
It is interesting to note that this service involved Rincent BTP Rwanda for the tests on the two sites, Rincent BTP Chad for the tests analysis and Rincent Research Expertise for the technical management of the mission.

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