Rapid and Accurate Rubber Contents Analyzer
A vital instrument for Natural Rubber Industry. Jointly developed by Malaysian Rubber Board (MRB) and FOSS

- RRIMETER is an instrument based on the application of Near Infrared Spectroscopy (NIR) scanning of the latex and raw rubber samples and quantitatively determinate of the rubber & non-rubber content by multivariate data analysis.
- The calibration and validation of measured NIR spectral data are correlated through statistical methods to the reference data which is determined by the recognize reference methods.
Development Background

- Early exploratory work started in early 2014.
- Focused on development of calibration model for the determination of dry rubber contents (DRC) for latex and solid rubber.
- Continued using various sample sources, different seasons, storage conditions and locations.
- Effective collaboration of experts from MRB (rubber science) and FOSS (NIR spectroscopy) contributed to commercialization of RRIMeter

**RRIMETER offers an efficient technique to overcome various technical issues related to determination of rubber contents which affects all sectors of rubber industry**
Large samples of raw rubber were used in development process involving calibration with the standard laboratory method.

Success of DRCC determination led to expansion of RRIMeter to include rubber contents and other types of rubber.

Field Latex Sample 1, Laboratory results = 33%  
NIR Result = 33%
CALIBRATION MODEL OF \textsc{rrimeter}

Calibration was conducted according to ISO12099 – Guidelines for application of NIR spectrometry

**Seasonal**
- Low, medium and high yielding periods

**Source (Location)**
- MRB Research Stations, rubber dealers, raw rubber processors, imported latex concentrate and Cuplumps

**Development of Calibration**

**Storage/sample condition**
- Fresh raw rubbers, aged sample and commercial samples

**Clonal (Genetic)**
- Individual rubber trees from various clones and mixture of clones
ABSORBANCE SPECTRA BY RRIMETER

Position 1: Sample number 0_FLX1A

Log (1/R) - Normal sample axis

Solid rubber
Latex Concentrate
Field Latex

Wavelengths
1100 1237 1375 1512 1650

NIR region
Absorption by stretching - bending

X = 1375.0  Y = 0.40113643

Position 1: Sample number 0_FLX1A
Position 2: Sample number 0_LOSA
Position 3: Sample number SL01A

Absorption types:
- Overtone
- O-H
- N-H
- Combination
RRIMeter offers capability for measuring rubber and non-rubber contents for various types of rubbers in a single equipment.

<table>
<thead>
<tr>
<th>Material</th>
<th>Available for</th>
<th>On-going Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latex concentrate</td>
<td>DRC, TSC, Alkalinity</td>
<td>KOH No.</td>
</tr>
<tr>
<td>Field latex</td>
<td>DRC</td>
<td>TSC, Protein content, Sugar content</td>
</tr>
<tr>
<td>Cuplump/Crepe rubber</td>
<td>DRC</td>
<td></td>
</tr>
<tr>
<td>TSR</td>
<td>Nil</td>
<td>Volatile matter content, N₂ content, Ash &amp; dirt content</td>
</tr>
<tr>
<td>Natural rubber serum</td>
<td>Nil</td>
<td>Protein content, Sugar content</td>
</tr>
<tr>
<td>Compounded latex</td>
<td>By request</td>
<td></td>
</tr>
</tbody>
</table>
An instrument for rapid, simple and accurate method for determination of rubber & non-rubber contents in various types of rubber

Key advantages for meeting the needs of rubber industry

- Fast results, less than 1 minute
- Multiple parameter analysis
- No chemicals required
- Non-destructive
- Reliable and robust instrument
- Low maintenance
- Minimal sample preparation
POTENTIAL MARKET OF

Local and International

Upstream
- Rubber plantation
- Cooperatives
- Rubber dealers
- Rubber traders
- Collection center

Midstream
- Latex concentrate processor
- SMR processor
- Specialty Rubber Factory
- Raw rubber laboratories

Downstream
- Latex product manufactures
- Glove manufactures

Government agencies and authorities
Universities, technical colleges and research institutions
## Chronologies and endorsement by MRB-
### Looking forward..

<table>
<thead>
<tr>
<th>No</th>
<th>Activities/ event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Approval from MRB management for the use of NIR technology in DRC determination for the rubber industry</td>
<td>August 2015</td>
</tr>
<tr>
<td>2</td>
<td>Approval from MRB Board of Director for the use of NIR technology as alternative method in determination of DRC for the rubber industry and commercialization agreement with FOSS</td>
<td>August 2015</td>
</tr>
<tr>
<td>3</td>
<td>Briefing and demonstrate to former Secretary General of Ministry of Plantation Industries and Commodities</td>
<td>August 2015</td>
</tr>
<tr>
<td>4</td>
<td>Registration of Trademark - RRIMETER</td>
<td>Sept. 2015</td>
</tr>
<tr>
<td>5</td>
<td>Meeting and finalise commercialization agreement with FOSS Headquarter at Copenhagen, Denmark</td>
<td>Oct. 2015</td>
</tr>
<tr>
<td>6</td>
<td>Approval from MRB Board of Director for the final draft of commercialization agreement with FOSS</td>
<td>Oct. 2015</td>
</tr>
<tr>
<td>7</td>
<td>Briefing and demonstrate to former Minister of Ministry of Plantation Industries and Commodities (MPIC)</td>
<td>Dec. 2015</td>
</tr>
<tr>
<td>8</td>
<td>Approval from MPIC for commercialization agreement with FOSS</td>
<td>Aug. 2016</td>
</tr>
<tr>
<td>9</td>
<td>Launching of RRIMETER by Honourable Minister</td>
<td>Dec. 2016</td>
</tr>
</tbody>
</table>
IMPACT OF RRMETER

1. National Policy – Improvement of transparency and efficiency of rubber analysis and trading activities
   - Imported raw material - authority requirement, cess exemption, factory procurement and payment
   - Rubber trading - factory, multilevel of dealers and smallholders
   - Factory production and quality control

*Standardised method with a single (identical) calibration to ensure consistent results for all users*

**Methods for DRC Determination in Raw Natural Rubber**

<table>
<thead>
<tr>
<th></th>
<th>ISO 126: 2005</th>
<th>Metrolac Method</th>
<th>Spot Method</th>
<th>RRMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td>High</td>
<td>Poor</td>
<td>Moderate</td>
<td>High</td>
</tr>
<tr>
<td><strong>Error cause by handling</strong></td>
<td>Yes</td>
<td>Moderate</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Procedures</strong></td>
<td>No of steps</td>
<td>No of steps</td>
<td>Simple</td>
<td>Simple</td>
</tr>
<tr>
<td><strong>Adulteration/ manipulation</strong></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><strong>Calibration</strong></td>
<td>Manual</td>
<td>Manual</td>
<td>Manual</td>
<td>On-line</td>
</tr>
<tr>
<td><strong>Chemical</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
IMPACTS OF MMMETER

2. National and Industry Policy - Enhancing Competitiveness of Malaysian Rubber Industry
   a. Requirement for product quality and specifications:
      ✓ Evaluation of incoming raw materials
      ✓ Quality control of manufacturing process and products
      ✓ Requirement for compliance of product specifications
   b. Improvement of efficiency for analytical services
   c. Environmentally-friendly and safe analytical technique
   d. Overall improvement of raw materials supply and quality
Terima Kasih
Thank You
**Calibration - Standard Guide**

<table>
<thead>
<tr>
<th>Model</th>
<th>Standard Guideline</th>
</tr>
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<tbody>
<tr>
<td>Field Latex</td>
<td>LGM-UPB-L001 DRC</td>
</tr>
<tr>
<td>Latex concentrate</td>
<td>ISO 126: Natural rubber latex concentrate-Determination of dry rubber content</td>
</tr>
<tr>
<td>Solid rubber</td>
<td>MS2531:2013 Rubber, raw natural - Determination of dry rubber content (DRC)</td>
</tr>
<tr>
<td></td>
<td>MS 2579:2014: Raw natural rubber: Rapid determination of dry rubber content for field coagula</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>ISO 125:2011 Natural rubber latex concentrate-Determination of alkalinity</td>
</tr>
<tr>
<td>TSC</td>
<td>ISO 124:2008 Latex, rubber: Determination of Total Solid Rubber</td>
</tr>
<tr>
<td>KOH No.</td>
<td>ISO 127:2012 Latex, rubber: Determination of KOH No</td>
</tr>
<tr>
<td></td>
<td>MS466:1987 Method of sampling and latex testing</td>
</tr>
</tbody>
</table>
The number and charges for DRC test for 2015

GTACR Laboratories, LGM

a) Latex DRC Lab
   No of testing : 11,756 samples
   Testing charge : USD 4/ sample

b) Wet Lab (for solid rubber)
   No of testing : 6,439 samples
   Testing charge : USD 8/ sample