Automatic Binder Extraction Principles Using Asphalt Analyzer Rubber

1. What is the asphalt analyzer
2. How to promote safe handling of solvents
3. Installation requirements
4. Test set up sequence
5. Results
   • Aggregates
   • Filler
   • Binder
   • Rubber particles
6. Focus on solvent distillation
7. Rotary evaporator step
8. Maintenance
9. Questions
ASPHALT ANALYZER RUBBER

EN 12697/1 - ASTM D2172
Automatic binder extraction in closed solvent based system
Asphalt Analyzer: Making Solvent Use SAFE

Filling Device with foot pedal

DOW SAFECHEM – our worldwide partners in SAFE worldwide asphalt extraction

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SAFECHEM
be responsible
Advantages

- Closed cycle system, minimizes solvent emissions to ensure a clean and safe working environment
- Complete separation of binder from aggregate
- Preservation of binder and additives

- 95 minutes average time from the start of the test until complete extraction of binder + aggregate + filler + GTR particles

Adjustable for various types of solvents:
- Trichlorethylene (Tri)
- Methylchloride
- Perchloroethylene (Per)
Asphalt Analyzer: Test Set-Up Sequence for Non-Rubber Asphalt Mix

1. Fill washing drum with sample (max. 7.7 lb/3.5 kg)/ Weigh the sample
2. Close the washing drum.
3. Insert drum into the washing chamber
   a. Close the washing chamber door (secured lock that remains closed until extraction complete)
Set-up for Rubber Modified Asphalt Sample Extraction

**Step 1:** Place rubber modified asphalt sample into washing bucket

**Step 2:** Scooping mechanism attaches to stirrer inside bucket

**Step 3:** Secure scooping unit and close bucket
Asphalt Analyzer: Test Set Up Sequence

4. Insert paper liner into the centrifuge filler cup (Max filler capacity: 10.58 oz/300g)

5. Insert filler cup into centrifuge (Close the centrifuge cover)

6. Choose the program sequence on touchscreen.
Rubber Model Asphalt Analyzer: Test Set Up Sequence

4. Insert paper liner into the centrifuge filler cup (Max filler capacity: 10.58 oz/300g)

5. Insert filler cup into centrifuge (Close the centrifuge cover)

6. Choose the program sequence on touchscreen.
Results for Rubber Modified Asphalt Sample
Asphalt Analyzer: Results
Washing drum principle

3 solvent spraying nozzles

Max 3.5 kg asphalt mix

Revolving washing drum

Ultra Sonic System
Washing drum principle

Integrated heating system – yeilds clean dry results

Size of mesh: 0.063 µm (0.09 in some countries)
Asphalt Analyzer: Results

Filler
High speed centrifuge

Max cup capacity: 300g

8000 rpm

Intergrated heating system – yeilds dry filler results

Solvent binder mix flows through into distillation chamber

Filler particles do not enter into binder mix
Decantation Principle for Rubber Particle Separation

1. Rubber particle collector
2. Particle agitator (stirrer)
3. Filler/Non rubber fines Mesh (63 microns)
4. Binder + Fines (non rubber) flow into centrifuge

- All size rubber particles separated from Asphalt mix into special compartment
- Aggregates above 63 microns separated, dried, stored
- Fines below 63 microns separated, dried, stored in centrifuge compartment
- Binder collected in distillation chamber
Asphalt Analyzer: Results

Binder/solvent mixture
Asphalt Analyzer: Results

Left Side: Clean TCE Tank (25L)

Right Side: “Dirty” TCE + Recovered Binder Tank (25L)

Left Side: Clean TCE Tank (25L)

Right Side: “Dirty” TCE + Recovered Binder Tank (25L)
### Solvent Efficiency Management

After extraction 4:

| % RETURN OF SOLVENT AUTOMATICALLY INTO THE CLEAN TANK VIA ANALYZER DISTILLATION/CONCENTRATION PROCESS | 97.67% |
| PERMANENT SOLVENT LOSS THROUGH EXHAUST DURING EACH EXTRACTION | 25ml |

Empty the dirty side of the distillation chamber into a glass flask.

Recover 0.6 Liter of solvent in a rotary evaporator.
Asphalt Analyzer: Results

Rotary evaporator

Note: Solvent recovered in rotary evaporator can be added back to clean TCE side tank after stabilization
Asphalt Analyzer – Timing Sequence

Total extraction time for 1.5 kg of asphalt mix:

1. Sample Preparation: 15 min
2. Extraction of Rubber Particles 50 min
3. Extraction of Binder+Aggregates + Fines 45 min

Now quantitative analysis of the binder can begin.

4. Rotary evaporator: 40 min

Now physical properties of binder can be measured.
Asphalt Analyzer – Maintenance

1. Weekly – Solvent Quality Monitoring with Solvent Test kit

2. Annually (depending on use) – change out mesh on washing drum

3. RAS mixes require additional clean out of drum mesh and viewing glass mesh after each extraction
Thank you!
Questions? Comments?

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