FAA Airport Pavement Working Group Meeting
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PRACTICAL AIRPORT PAVEMENT M&R MANAGEMENT

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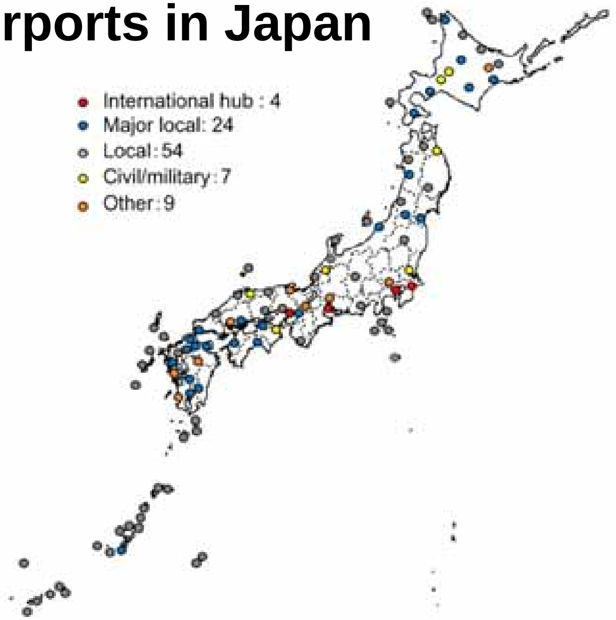
Contents

- Performance of Airport Pavements
  - Structure
  - Safety
  - Surface Course Durability
- APMS (M&R) in Japan
  - Inspection & Maintenance
  - Evaluation
  - Rehabilitation

Airports in Japan



PERFORMANCE OF AIRPORT PAVEMENTS

Required Performance

- Structure
  - Subgrade & Bases (Bearing Capacity & Frost), HMA - Fatigue & Rutting
- Safety
  - Rutting, Surface Friction
- Surface Course Durability
  - Aging, Raveling, Debonding between Layers

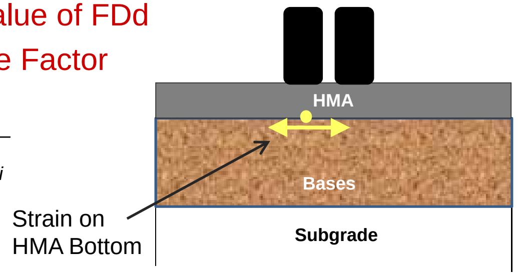
Structure

- Performance-Based Design - Verification
  - ex: Fatigue Cracking in HMA

$$\gamma_i \cdot FD_d / FD_{dl} \le 1.0$$

- FD_d : Design Value of Fatigue Damage
- FD_{dl} : Limit Value of FDd
- γ_i : Importance Factor

$$FD = \sum_{i=1}^{m} \frac{n_i}{N_{f\,i}}$$



Safety

- Surface Friction
  - Coefficients of friction are periodically inspected

Grooving		Tire pressure
w	w/o	
0.55	0.45	Low
0.45	0.4	High

by Surface Friction Tester

- Grooving is generally required

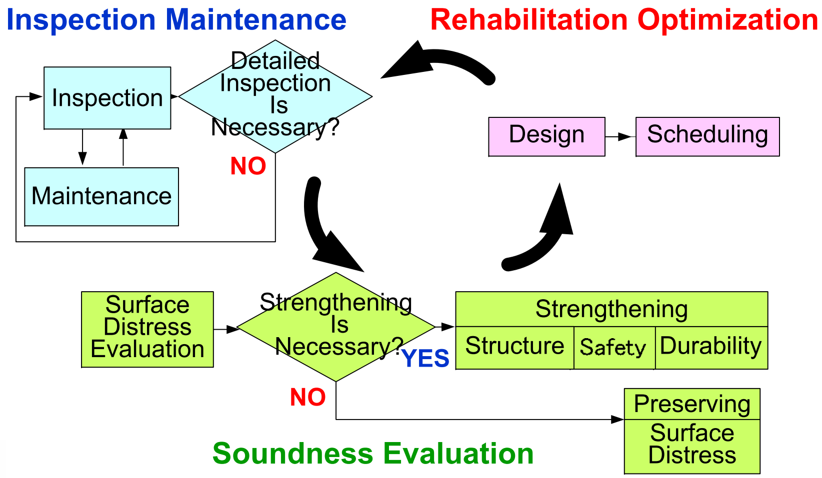
- Surface Configuration
  - Follows the ICAO Recommendations

Surface Course Durability

- Debonding between Layers
  - Materials are specified as follows;
    - Increase Aggregate Size
    - Use Polymer-Modified Asphalt
    - Secure Air Void 3% or more
    - Increase Single Lift Thickness to 80mm
    - Use Warm Mix Asphalt if necessary

AIRPORT PAVEMENT M&R MANAGEMENT SYSTEM IN JAPAN

Airport Pavement M&R Management



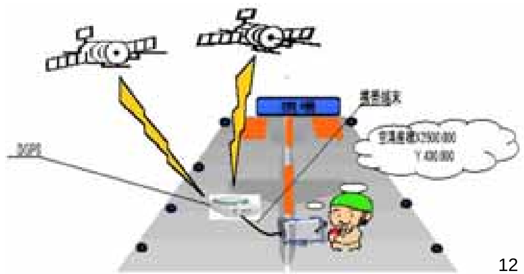
INSPECTION AND MAINTENANCE PHASE

Pavement Inspection

- Patrol
  - Visually, on foot or slow-moving vehicle
- Emergent
  - Visually, after earthquake
- Detailed
  - When necessary, surface distress by measuring vehicle & structure by FWD, etc.
- Periodic
  - Surface distress and configuration

New Inspection Patrol System

- Mobile PC & Differential GPS
- Process
  - Identification
  - Evaluation and treatment
  - Description and photographing
  - Reporting



SOUNDNESS EVALUATION PHASE

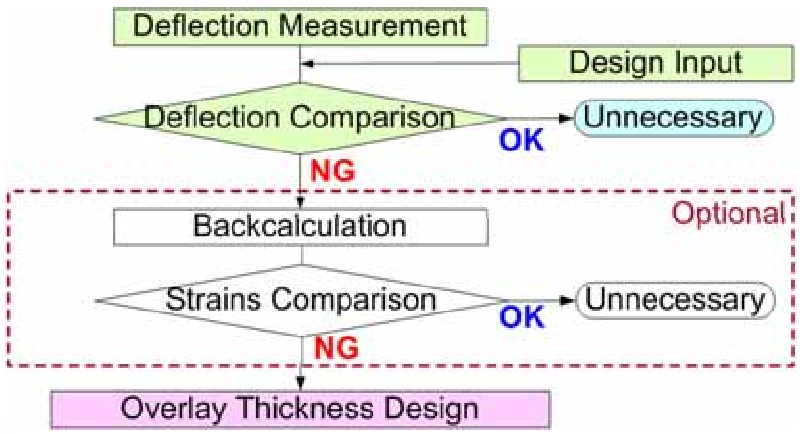
Surface Distress

- PRI (Pavement Rehabilitation Index)
  - PRI = 10 - 0.450CR - 0.0511RD - 0.655SV
    - CR: Crack Ratio, RD: Rut Depth, SV: Roughness
- The need for rehabilitation works
  - A: unnecessary
    B: in the near future (sub-classified into 3 cat.)
    C: immediately

Facility	A	B	C
Runway Taxiway Apron	8.0 < 6.9 < 5.9 <	3.8 – 8.0 3.0 - 6.9 0.0 - 5.9	< 3.8 < 3.0 < 0.0

SOUNDNESS EVALUATION PHASE

Structural Evaluation with FWD



Overlay Design

- Existing Pavement Evaluation
  - Experienced traffic volume, components & properties of existing pavement
- Design Conditions
  - Design period, loading conditions, climate, fatigue properties of new HMA
- Fatigue Analysis
  - Strains of HMA, aircraft wandering
- Overlay Thickness Design

Design Example

- Fatigue Damage (FD) of Existing HMA Bottom Layer
- Accumulated till the Present: 0.8
- Added after Overlay: 0.204 – 0.142
- Summed: 1.004 - 0.942
- Overlay Thickness: 80mm

Overlay Thickness (mm)	Accumulated FD	Added FD	Summed FD	Judgment
70	0.8	0.204	1.004	NG
80	0.8	0.171	0.971	OK
90	0.8	0.142	0.942	OK

REHABILITATION OPTIMIZATION PHASE

Rehab Work Scheduling

- AirPORTS (Airport Pavement Optimal Rehabilitation Timing System)

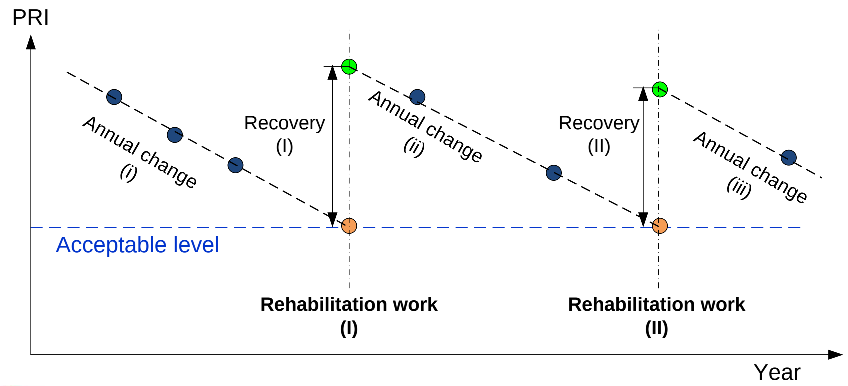
Database
Annual change of PRI
Recovery of PRI due to rehabilitation works
Cost of rehabilitation work

Optimal Rehabilitation Procedure Selection
Acceptable PRI

Rehabilitation Cost Prediction
Annual rehabilitation cost for service duration

Rehabilitation Budget Allocation
Annual rehabilitation budget smoothing

Annual Change & Recovery of PRI



Optimal Rehabilitation Schedule

Currently Conducting Studies

- Refining AirPORTS
  - Osaka & Nagasaki Airports were surveyed
  - Extending to Nationwide
- Simplified Rehab Needs Judgment
  - Utilizing Monthly Inspection Data
  - Applying to Local Airports
- Practical Performance Based Design
  - Developing Issues on Rutting, etc.