



Status of sport fields in China

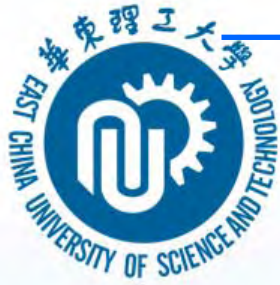
中国运动场地面层状况与对策

Jianding CHEN
陈建定

SSTL-CAA-ECUST

中国田径协会田径场地人工合成面层检测实验室





Part 1

General sports fields in China 我国运动场地面层状况

Part 2

Problems and countermeasures 存在问题与对策



1. Sports field scale of China 我国体育运动场地规模

Periodic surveys on sports ground of China, 5 surveys during 1970's~2000's

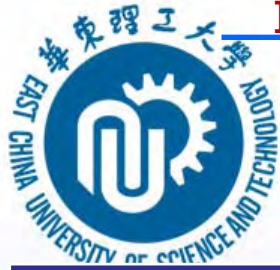
1970~2000年代，全国体育场地普查5次

The 5th survey took 18 months for a total of 64 kinds of sports venues

第5次全国普查64种标准体育场地，历时18个月。

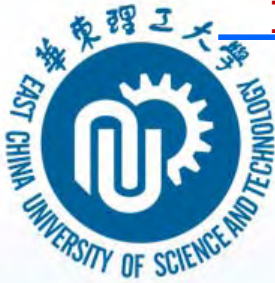
The 6th survey will be open in 2013, the standard time on Dec. 31, 2013

2013年第6次普查，标准时点2013年12月31日



Tab. 1 Sports field survey project
体育场地普查项目

Fields 场地名称	Style & Specification (64 types) 类型
Palaestra 体育场	≥6 tracks of 400m standard fields with the football pitch, ≥ 500 seat 6条以上400米标准跑道、带足球场，固定看台≥500座
Track field 田径场	200~400m standard racetracks 200~400米标准跑道，无固定看台。
Grounds for ball 球类场地	Football, basketball, volleyball, tennis, hockey, sphere, pitches, et. al. 足、篮、排、网、曲棍球，门球、地掷球场等
Gymnasium 体育馆	Badminton, Pingpang, table tennis, indoor facilities with a fixed stand 羽毛球、乒乓、有固定看台室内体育设施
Others 其它	Swimming pool, diving pool, billiards room, martial arts room, weight room, wrestling judo room, gym, chess room, roller skating field, golf, gymnastics room, water venues, fitness path..... 游泳馆、跳水池、台球房、武术房、摔跤柔道房、举重房、健身房、棋牌房、轮滑场、高尔夫球场、体操房、水上场地、健身路径.....



The total number of Sports fields 各种场地总数

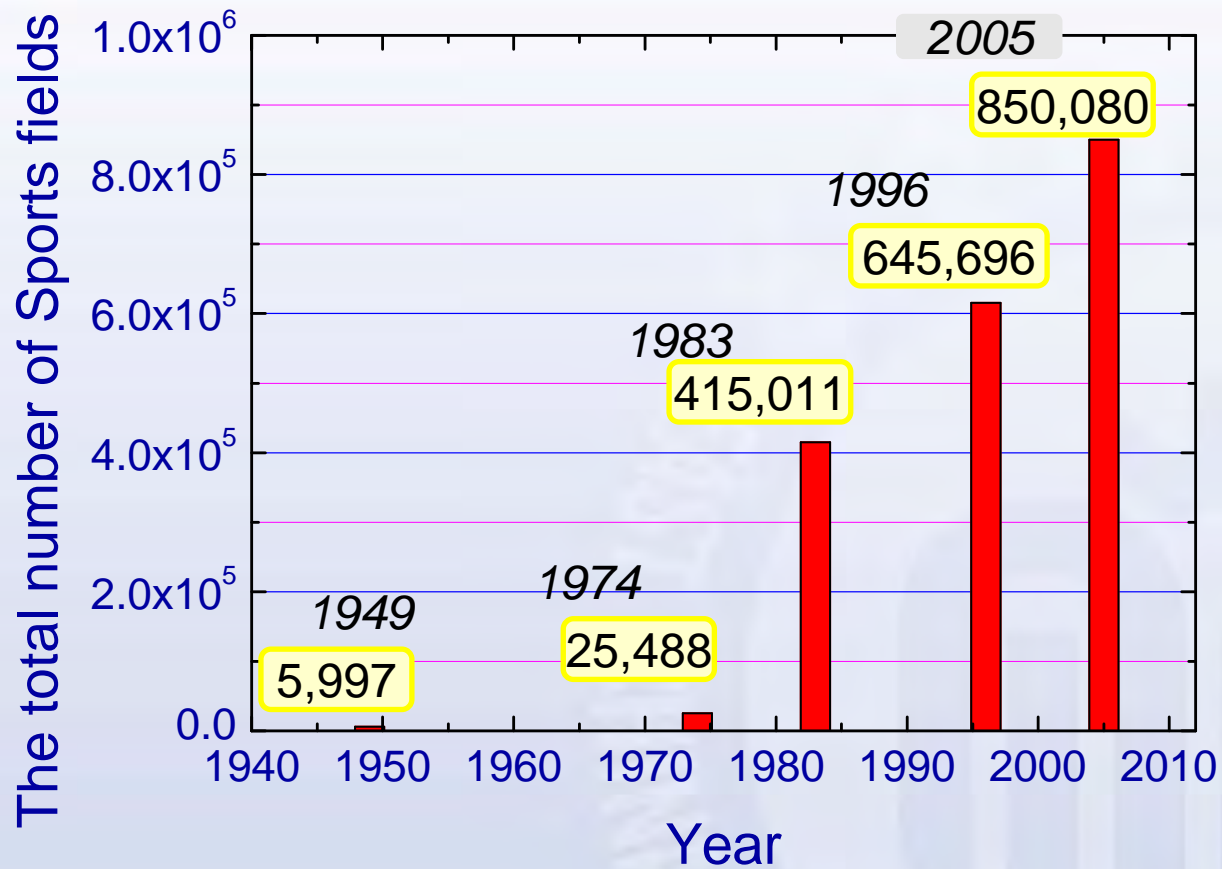
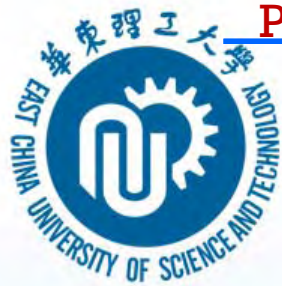


Fig. 1 Various sports venues growth



Tab. 2 Sport field area and pieces per capita in China
我国体育场地面积及人均水平

普查年份	总数	占地面积	场地面积	当年人口	每万人 场地数	每片场地平 均人数	人均场地面 积
Surveys year	Total fields (pieces)	Cover area ($\times 10^8$ m ²)	Sport surface area ($\times 10^8$ m ²)	Population annual ($\times 10^8$ p)	Fields per 10 ⁴ persons (pieces/10 ⁴ p)	Persons per field (P/piece)	Average surfaces per person (m ² /P)
4 th 1996	615,693	10.7	7.8	11.985	5.1	1,947	0.65
5 th 2005	850,080	22.5	13.3	12.923	6.6	1,520	1.03
Increase (pieces)	234,387	11.8	5.5	0.938	1.6	-427	0.38
Increase %	38.1	110.3	70.5	7.8	31.4	-21.9	58.5



2. Distribution of sport fields in China 我国运动场地分布情况

**Tab. 3 Distribution of sport fields of China in 2005
2005年我国体育运动场所分布**

单位	总数	校园场地	机关、事业、 政府	乡镇、厂矿、社区	其它
Unit	Total fields	In Schools	In enterprises & offices	In villages, towns, factories, mines, & community	Others
pieces	850,080	549,654	75,033	134,121	91,272
proportion %	100	64.7	8.8	15.8	10.7



Tab. 4 The outdoor and indoor, standard and no-standards sports fields

室内、室外场地和标准非标场地比例

普查年份 Surveys year	总数 Total Fields	室外 Out door Fields	室内 Indoor Fields	标准场地 Standard fields	非标准场地 non-standard fields
4 th 1996 (pieces)	615,693	574,937	26,023		
proportion %	100	95.78	4.22		
5 th 2005 (pieces)	850,080			547,178	302,902
proportion %	100			64.4	35.6



Tab. 5

Comparison on the fields of the coastal areas and the mainland

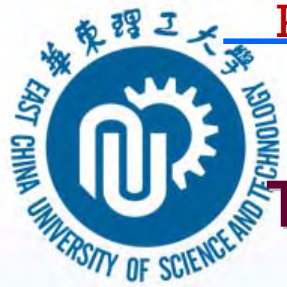
沿海地区与内陆地区的比较

省	面积	城市个数	场地个数	场地面积	标准场地	标场占总场地	当时人口 (万)	人均场地面积
Province	Province area ($\times 10^4$ km ²)	City number	Total fields (pieces)	Surfaces area ($\times 10^4$ m ²)	Standard fields (pieces)	Proportion Standard to total fields %	Population ($\times 10^4$)	Surface area per person (m ² /P)
江苏 Jiangsu	10.26	13	40,743	6,958	25,614	63	7,406	0.94
江西 Jiangxi	16.69	11	22,738	3,225	11,831	52	4,222	0.76



Tab.6 Investment for sport fields in China
我国体育场地资金投入情况

普查年份 Survey year	投入资金 (亿元) Investment ($\times 10^8$ Yuan)	造价(含空地) Average cost /cover area	场地平方造价 Cost /surface area (Yuan/m ²)	人均投入(元) Investment /person (Yuan/P)
4 th 1996	372.0	34.9	47.7	31.04
5 th 2005	1,914.5	85.1	143.9	148.15
Increase	1542.5	50.2	96.1	117.11
Increase %	414.7	143.8	201.7	377.3



**Tab.7 Cost of standard and non-standard fields
标准与非标体育场地的造价(2005)**

场地类型 Field type	总数 Total Fields (pieces)	占地面积 Cover area ($\times 10^8 \text{ m}^2$)	场地面积 Surfaces area ($\times 10^8 \text{ m}^2$)	投入资金 (亿元) Investment ($\times 10^8 \text{ yuan}$)	造价平均 Cost /cover area (Yuan/m ²)	场地造价 含建面 Cost /surface area (Yuan/m ²)
Standard fields	547,178	15.3	11.1	1642.8	107.37	139.91
non-standard fields	302,902	7.3	2.1	271.7	37.22	122.88



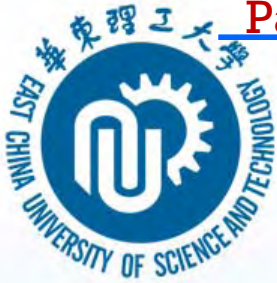
3. Test and Check before Acceptance or Use of Sport Surface

标准场地验收情况



Tab.8 Standard tracks tested and checked by CAA before acceptance and use

统计年份 stat. year	验收合格场地（片） Qualified acceptance fields (pieces)
2000~2002	128
2003	109
2004	174
2006	121
2007	156
2008	131
2009	192
2010	201
2011	169
2012 (1/1~5/31)	43



Part 2

Problems and countermeasures

存在问题与对策

- 1. The surface layer quality and service life**
面层质量与使用寿命
- 2. Environmental protection**
环保问题
- 3. Standards (not perfect)**
标准不完善
- 4. Countermeasures**
解决办法



1. Quality and service life

Synthetic track surfaces:

A) Water permeable tracks
the tensile properties, force reduction (Fr) % is lower.

B) non-Permeable (mixture type) tracks
the lower Fr % is a serious problem.

C) Composite (combined type) tracks
PU glue infiltration, low-grade materials
the tensile properties and Fr% are lower .

D) Prefabricated Sheet
Fr % & friction are lower.

Service life :

a short-term application, broke after 3~5 years...
abnormal installation, frothily, layered, fall to pieces



2. Environmental protection

Volatile organic components:

Asphalt solvent

PU adhesive solvent

Volatile components

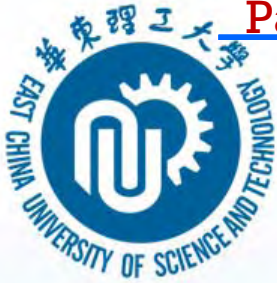
Synthetic glue did not reach the designated quality, since higher viscosity, adding the toluene or xylene...

Problem:

Take the focus only on TDI, MDI, and insufficient attention to the pollution of organic solvent.

Using lower cost materials to install surface, cause the shorter life for service.

The used surfaces is problem for recovery when the renew for fields.



3. Standards

Lack of standards for new kind of fields:

- a) new synthetic surfaces for pitches
- b) synthetic Si-PU surfaces for outdoor basketball ground
- c) granule-glued surfaces, for outdoor basketball ground
- d) cure PU, a kind of surface for outdoor pitches

Lack of standards for the performance of turf:

- a) the grass fiber made by PE, PP, PE/PP, PA etc.
- b) the back base coated by styrene butadiene latex (SBR), PU paint etc.
- c) different reinforcing material layer for the base



4. Countermeasures

Should consider:

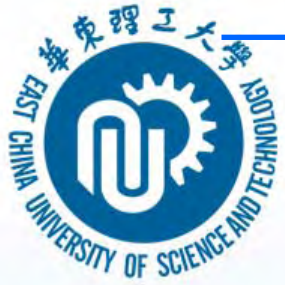
to improve the synthetic technic for glue

to develop the new materials for high performance

to prohibit the use of solvents

to perfect the standards for various sport fields

to strengthen the management



Thanks !