

The trend of amusement rides and Jinma's tilting coaster

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1. Current world's trend of theme park industry

The theme park industry has gone through a very tough period in 2020 affected by COVID-19, and this can be seen from many data and report. IAAPA--the largest international trade association, has released a 5 years(2020-2024) outlook report for the Global Theme and Amusement Park Industry. The report shows that: The global theme and amusement park market rose 6.5 percent in 2019, down from the 6.8 percent increase in 2018 but still above the gains recorded in 2016-17. Attendance growth dropped to 1.6 percent in 2019, the smallest increase during the past five years, while per capita spending increased 4.9 percent, the largest gain during the past five years. Those growth rates are not unrelated as the emphasis shifted from strategies designed to increase attendance to strategies designed to boost yield, or revenue per attendee, through aggressive pricing by a number of parks. Between 2014 and 2017, attendance rose 4.2 percent on a compound annual basis, more than twice the 2.0 percent compound annual increase in per capita spending.

During the past two years, however, that relationship virtually reversed with per capita spending rising at 4.1 percent compound annual rate, nearly twice the 2.5 percent increase compounded annually for attendance. With parks getting more crowded and with long lines for rides and attractions becoming a detriment to the park experience,

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incremental attendance growth for many major parks began to face diminishing returns.

In 2020, of course, all that changed with the onset of the COVID-19 global pandemic. Theme parks in virtually every country were closed for an extended period. Parks that reopened were operating under greatly limited capacity, and many were open for fewer days and fewer hours. Seasonal parks were closed during a significant portion (if not all) of their peak season, leading to steeper declines than year-round parks. We estimate attendance for 2020 fell by more than half – 58.4 percent. We expect per capita spending to continue to rise as attendees in the COVID environment are likely to be the most avid theme park enthusiasts and the most affluent patrons which will translate into higher spending per capita on food and merchandise. In fact, less attendance and lower density may also contribute to higher per capita spending. Also, with some annual passholders visiting parks less frequently in 2020, average ticket price per visit increases, contributing to the rise in per capita spending. The projected 0.1 percent increase in global per capita spending in 2020 is misleading as we are predicting larger increases in each region. However, we are also projecting North America, the highest per capita spending region, to decline in its share of the global market. As lower per capita regions gain share, their impact on the global average will increase, cutting into overall global per capita spending. Total theme park spending in 2020 declined by an estimated 58.4 percent.

A lot of resources have been allocated to developing a vaccine, and vaccines were made available in early 2021, much faster than the historical experience. Nevertheless, it will take time before vaccines will be available to the entire population. New strains of COVID-19 could complicate that scenario but on balance we expect fewer COVID-19-related deaths and better medical outcomes in 2021 compared with 2020. Consequently, we expect more parks to be open for a full season in 2021 than in 2020. Conversely, capacity limitations will likely remain in effect, which will limit attendance.

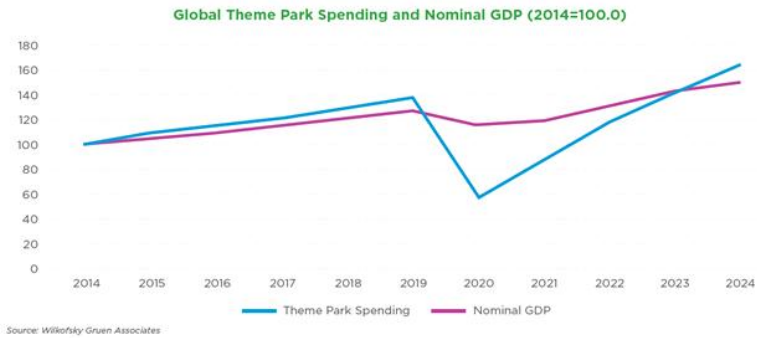


Figure 1. Global theme park spending and nominal GDP (source: Wilkofsky Gruen Associates)

2. China's theme park market status

Benefiting from the well control of COVID-19, China's Amusement Industry have nearly recovered to normal status since May of 2020. Almost all theme parks are receiving guess with full capacity, and the business is good. Shanghai Disneyland is adding a first-ever Zootopia themed land, and Sunac Group is opening four tourism complexes: in Guangzhou, Wuxi, Chengdu, and Chongqing. Three LEGOLAND projects have also been announced to open by 2024 in Shanghai, Shenzhen, and Sichuan. Universal Beijing Resort is also set to open in 2021.

So we can say that, even under the pandemic, China's market is still developing rapidly and healthily. Compared with the total consumption of the U.S. and Japan's markets, we can see that the China's market is still very potential.

3. Jinma rides-a major industry player

Jinma Rides, aka Golden Horse Rides, is one of the leading amusement rides designers; R&D of upmarket rides and immersive attractions; the only listed amusement rides manufacturer in China (Stock Code: 300756); the only local rides supplier for the world-class resorts in Shanghai and Beijing,

the only Chinese rides supplier for a world-class resort in Singapore.

Listed on Shenzhen Stock Exchange: Jinma has grown into a global rides designer and player since 1983. Headquartered in Zhongshan, Jinma owns three production bases (respectively R&D of major rides, R&D for immersive and dark rides, fabrication of Roller Coasters), and two international subsidiaries, one in Hong Kong, and the other in Switzerland for engineering rides and attractions based on EN standard.

Jinma Global Family: With a facility of 150,000+ sqm, staff 1000+, engineers 200+, and patent 136, copyright 16, as well as the cutting-edge technologies in molding and fabrications, Jinma is able and experienced to be involved in IP-themed projects with international quality. Please contact and see how we achieve it in an affordable way.



Figure 2. Jinma Ride's global market locations(source: Jinma ride)

4. The new roller coaster by Jinma

A very breathtaking thrilling Roller Coaster--Tiling Coaster KSC-24B, has just landed in Suzhou Paradise Forest World and was opened to the public on May 20, 2020. Suzhou Paradise Forest World is the new name of Suzhou Amusement Land--a very famous park in China which is regarded as "Disneyland of China". As a new comer of the park, Tilting Coaster KSC-24B has the mission of bringing more fun to the

passengers, especially to whom pursuit thrills and excitements, this is obviously not a small task (Figure 3).

- Park name: Suzhou Paradise Forest World
- Park location: Suzhou, Jiangsu Province, China
- Ride name: Tilting coaster KSC-24B
- Designer: Jinma Rides
- Opening date: May 20, 2020



Figure 3. Jinma tilting coaster KSC-24B(source: Jinma ride)

4.1 Playing process:

A journey promising tons of thrill and excitement begins when passengers enter the train and get themselves secured on the seats. The train departs from the station and moves smoothly to the foothill where the train is hooked and chain lifted to the top of the 40-m high platform. Now that you are high up in there and there is no going back.

At 40 meters above the ground, the train is being pushed towards the edge of the cliff, so tension starts building up and many a heart beats harder and harder as the train keeps going and is just about go off the cliff. The train does stop when half of its length extends beyond the edge of the cliff and fully locked into the tilt track. If you scream or cry a little already, that is OK, because it means you are not drained off and still able enough to shrill and shriek off the rest part.

The most suspenseful and scariest part begins. The tilt track works train, now dangerously perched at the cliff edge, to slowly tilt from the horizontal position to almost vertical and holds up passengers there in the air for a few very long seconds. Suspended in that diving position 40 meters high in the air, you hear winds and lucky enough one or two birds sing. Yet your palms are wet, heart racing, and you know only howling and shrieking now can keep your tension from surging too high. Still being suspended for another second, howl it and scream your lung out of it because you know it is just coming.

As you wish, it just happens and the train falls toward the center of gravity and coasts along a 70° sharp dive and continues for the rest of the easy and fun journey with a few loops, and inversions and spirals. This tilt roller coaster covers an area of 60m x 110m laid out with a 747m long track. The maximum velocity of the train reaches 89km/h with a maximum 4.5 G's. This new coaster features the tilting movement while compounding other popular coaster elements such as butterfly inversion, spiral, flip, etc.

4.2 Advanced technologies used in the Tilting Coaster KSC-24B

1. Jinma Rides introduced the latest 3D pipe bender from Europe, it greatly improved the smoothness of the track;
2. Diverse elements can be enjoyed, including subduction section, semi vertical section, horizontal section, spiral section, crescent section and nearly 70 ° vertical section;
3. Beside the traditional roller coaster elements, the Tilting Coaster adds the novel track-opening elements. Passengers can enjoy the whole process from horizontal to overturning, stopping, free falling, and the whole process is thrilling and exciting;
4. The Tilting Coaster is equipped with 2 trains, each train is available for 24 people, it is able to entertain 1600 riders per hour, the large load capacity make it be a big money maker of the park;

5. The overall layout of the track is advanced. The prominent elements such as semi vertical ring, spiral ring and turning platform are arranged outside of the ride, which correspond to the direction of park square or large flow of people, so as to attract tourists around and the queuing area to watch and feel the atmosphere;

6. The track adopts the track changing technology to improve the smoothness and comfort of the track;

7. By using a special acceleration test platform, the consistency between the actual acceleration and the theoretical simulation acceleration is verified;

8. The track design adopts the new generation of technology, with variable radius of the track, third-order derivable (acceleration); the mature oval curve technology is applied to the track design to eliminate the jitter of acceleration during the operation of vehicle body;

9. The design of the Tilting Coaster is safe and reliable. The mechanical interlock and electrical lock are used at the tilting track to ensure the safety;

10. The international advanced safety risk analysis technology of human, machine and human-computer interaction of amusement system is introduced. Through risk classification, different levels of risk are under control to ensure safety;

11. Introduce ISO 13849 and ISO 61508 to analyze the safety level of the control function in the amusement rides . According to the analysis results, select the safety circuit and control mode that meet the specifications, so as to make the safety control circuit reach the corresponding level;

12. The lifting section adopts mute technologies and double-anti reverse technologies, to improve the comfort and reliability of the Coaster;

13. Pneumatic brake and permanent magnet brake are used in the brake system, to make the braking process smooth, safe and reliable;

14. ANSYS is used for static analysis, dynamic simulation and transient analysis to make the Tilting Coaster more safe and reliable;

15. Magnetic particle, ultrasonic and other Non-Destructive Testing are used for key stress parts and key welds to ensure the safety.

16. Key components such as motor reducer, pneumatic components and electrical components, select reliable famous brands such as SEW, Schneider or Nord, to improve the reliability and stability of the whole ride (Table 1):

Table 1. Ride components and its brand

Components	Brand	Components	Brand
Reducer Motor	SEW	CPU	CPU
Proximity Switch	TURCK	SIEMENS	SIEMENS
Breaker	Schneider	DC Speed Regulator	DC Speed Regulator
AC Contractor	Schneider	SIEMENS	SIEMENS

4.3 Sales record:

The Tilting Coaster KSC-24B is very popular since it came out because of it's novel design and advanced technology! So far, 3 sets of Tilting Coaster KSC-24B are in operation and entertaining riders from all over the world. Here below is the sales record of the Tilting Coaster (Table 2):

Table 2. Project and its locations.

Project		Location	
Sunac Land	Anhui, China	合肥融创乐园	中国安徽
Daxingdong Park	Guizhou, China	大兴东乐园	中国贵州
Suzhou Paradise Forest World	Jiangsu, China	苏州森林世界	中国江苏

4.4 Technical specification of KSC-24B

Table 3. KSC-24B items and its specification

Item	Specification
Power	3N+PE 380V/220V 50Hz
Installed Capacity	400kVA
Drive Power	314.5kW
Max. Run Speed	89km/h
Track Length	747m+26.5m(repairing track)
Track Height	40.1m
Train Quantity	2pc
Rated Load	24riders/train
Area	60m×110m
Capacity per Hour	1600riders/h

5. Summary

Above all, we have enough reasons to believe that the Tilting Coaster KSC-24B designed by Jinma Rides is attractive enough, any park owner who wants to add a major thrill Roller Coaster may consider this tilt ride, any passenger who wants to experience thrill and excitement may ride this Coaster.

References

IAAPA (2021), IAAPA Global Theme and Amusement Park Outlook 2020 – 2024. Wilkofsky Gruen Associates, Inc.
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