

# ISR

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## 5-COUNTRY SPECIAL



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### ISR ON TOUR

REPORTS ON ROPEWAYS  
IN POLAND

### PRESENTATION

WHAT IS OITAF ?

### BASICS OF ROPEWAY ENGINEERING

THE ROPES USED ON ROPEWAY INSTALLATIONS



TO SEE

THE BEAUTY

FROM ABOVE



Surface lifts



Chairlifts



Gondola lifts



Alpine Coaster



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CHRISTIAN AMTMANN

Executive Editor

## EDITORIAL

### DEAR READERS,

This time our international correspondent Roman Gric has been out and about in Poland for you. His meticulously researched articles show once again what a big contribution ropeways make to economic success in the context of tourism development. Whether for winter or summer tourism, or as an attraction in urban recreational areas and theme parks, the ropeway manufacturers always provide the right solution with their know-how and experience, as the case of Poland clearly shows. In addition to ropeways, other mountain technologies such as snowmaking, snow grooming and summer facilities naturally make a major contribution, too. You will find the latest details in this issue of ISR.

Talking of major contributions, when it comes to global promotion of the ropeway industry, the leading actor is OITAF, the International Organization for Transportation by Rope, which is celebrating its 60th anniversary this year. Be sure to read the statement issued by the organization's President Jörg Schröttner and the article on the subject of "What is OITAF?" It provides

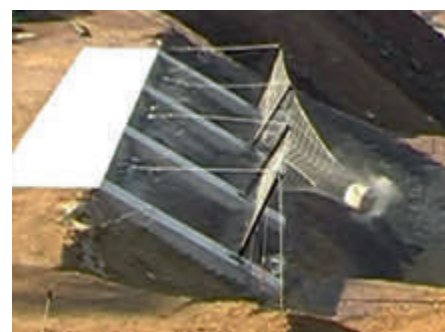
valuable information on OITAF's objectives and shows you how you and your organization can collaborate and benefit from an international exchange of knowledge.

For ISR, too, knowledge transfer in support of further positive developments in the industry has been one of our primary goals for more than 60 years now. That is also the reason why we have decided to make this the first issue in which we present a technical article by our ropeway engineering expert Josef Nejez. If you are interested in other articles in our Basics of Ropeway Engineering series, please do not hesitate to contact us.

Wishing you a good read and lots of success in the future,

Christian Amtmann  
christian.amtmann@isr.at

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MAG. JÖRG SCHRÖTTNER

President of OITAF



## OITAF'S 60TH ANNIVERSARY

**T**his year OITAF is celebrating its 60th anniversary.

That is an opportunity to take a close look at the purpose and benefits of this international organization.

What role is OITAF playing 60 years after its foundation?

The OITAF motto then and now:

“Promoting progress in the ropeway industry”.

This is achieved in the following ways:

- Through the preparation of recommendations by OITAF's expert committees (which have an influence on jurisdiction and the interpretation of standards in the field of ropeways)
- Through an international exchange of knowledge and experience
- Through lectures given at the annual seminar or the Congress
- As a platform for representing the industry to third parties (e.g. the EU)

The committees regularly discuss new developments in the ropeway industry and circulate their findings. OITAF's expert committees continue to draw up recommendations on a regular basis and publish them following approval by the Management Committee.

I would like to take this opportunity to thank all OITAF members and especially those who are actively involved in the work of OITAF.

OITAF is dependent on its active and paying members to carry out its work and to make its services available to members and other interested parties.

For that reason, membership in OITAF is to be made more attractive in the future, and I welcome all sug-

gestions and your active involvement in the matter.

One idea, for example, could be a service for members to provide them with answers to questions relating to the ropeway industry.

### OITAF SEMINAR IN INNSBRUCK

This year's OITAF seminar was held in Innsbruck on May 9 as part of InterAlpin 2019. It was organized by Expert Committee IV – Legal, Administrative, Economic and Statistical Matters. The theme of the event was: “Economic and Legal Aspects of the Ropeway Industry”.

We were privileged to hear prominent speakers, who provided interesting information on the following topics:

- Activities of the committee relating to legal, administrative, economic and statistical matters (Jörg SCHRÖTTNER)
- European ropeway statistics (Joaquin ALSINA)
- Economic and social impacts in the skiing and mountain resorts of the Pyrenees (Xavier CIVIT)
- Yield management (Nicolas PERRETTA)
- Value added by ski resorts: regional income and employment (Klaus GRABLER)
- Financing ropeway investments – possible improvements to the approval procedure (Christian KATTER)
- Lease finance for ropeways (Bernadette DANGL)
- Drop dampers for heavy loads (Konstantin KÜHNER)

There will soon be a new OITAF website. In this connection I am especially grateful to Dr Heinrich Brugger, former Secretary General of OITAF.

I am looking forward to further fruitful cooperation and also to welcoming numerous new members!

**ISR** worldwide communication



## Reaching the best mountain experience

Ski resorts around the globe place their trust in Doppelmayr/Garaventa. True to our reputation as a reliable partner, we always strive to provide our customers and their guests with the best possible solutions to enhance their winter sports experience on the mountain. That has always been our aim since building our very first lift and remains so to this day.

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# What is OITAF ?

**OITAF is the International Organization for Transportation by Rope. It was founded in Milan (I) in 1959. At present it has 155 members from 35 countries.**

## WHY OITAF ?

In order to solve pending problems on a common basis it was found necessary to unite in one organization the interests of the three groupings concerned with ropeways:

- the ropeway operators / owners
- the manufacturers of ropeway installations
- the supervisory boards / authorities (representing the country involved)

## WHAT ARE THE AIMS OF OITAF ?

The major aims of OITAF are

- to promote growth and progress in transportation by rope;
- to promote studies and experimental work likely to be useful for the development and progress of transportation by rope;
- to promote the harmonization of national regulations in the field of rope transportation;
- to draft uniform international guidelines and issue recommendations for the design, construction, operation, maintenance and supervision of ropeways;
- to hold international conferences on transportation by rope;
- to hold annual seminars.

## HOW DOES OITAF WORK ?

The organization's activities are entrusted to 4 bodies:

- a) the Assembly (where all members have the right to vote)
- b) the Management Committee (18 members elected by the Assembly and 5 members without voting rights representing countries that have no delegate in the Management Committee)
- c) the Executive Committee (7 members chosen amongst the members of the Management Committee and the Secretary General)
- d) the Auditors (5 members elected by the Assembly).

## WHO CAN BE A MEMBER OF OITAF ?

Membership of the International Organization for Transportation by Rope (OITAF) is open to all supervisory boards, associations, institutions, companies and persons concerned with technical, legal, administrative and economic aspects of transportation by rope, including ski-lifts. There are individual members and collective members.

## WHAT IS THE WORK DONE BY OITAF ?

160 members have been appointed to serve on 6 working committees and currently 2 working groups (variable number depending on necessity), who meet twice a year in order to address the following issues:

### **Working Committee n° I: Technique of ropeway systems and technical recommendations**

Scope of the committee:

- Development of technical recommendations on the design, construction and operation of ropeways, in particular in fields not covered by European or international standards, such as:
- Analysis of issues arising in the design of ropeways taking account of specific features of configurations and procedures for the operation, evacuation and maintenance of installations;
- Safety analysis of the overall system, subsystems and components of ropeways;
- Monitoring of developments in the construction and operation of ropeways and discussion of incidents and accidents;
- Preparation of draft recommendations on the above subjects;
- Organization of technical seminars.

### Subjects:

Examples of subjects discussed by Expert Committee I:

- Recommendation on the design and construction of ropeways
- Hazards and risk factors to be considered in safety analyses for ropeways;
- Guidelines for assessing modifications;
- Recommendations on the design and construction of chair-lift loading conveyors.

### Members:

Expert Committee I is currently made up of ropeway experts from seven European countries (A, I, F, D, E, CH, SLO) with a balanced mix of public authorities, operators and manufacturers.

### Working group:

Non-public ropeways: material handling ropeways and cable cranes

### Scope of the working group:

The last revision and integration of the text of the recommendations of notebook 8 was completed in 2016, resulting in the current version of the recommendations (Book 8-2).

It should be noted that the working group had in previous years carried out a complete revision of the old recommendations for the construction and operation of monicable and bi-cable aerial ropeways for material transport and cable cranes (previous book no. 8), publishing the 2006 version, which was subsequently revised and integrated in the 2010 and 2013 editions. The 2006 version also introduced new recommendations for the construction and operation of temporary cableways (with the exception of those for the exclusive transport of timber) and of inclined elevators for the transport of material. The recommendations already approved by OITAF for to and fro



bicable ropeways for the transport of material weighing up to 2000 kg, however, have been excluded from the group's work.

#### Composition of the group:

The working group is currently composed of a dozen technical experts from six European countries (A, D, CH, PL, F, I) with a balanced mix of representatives of supervisory authorities, operators and manufacturers.

The group's work will continue over the next few years to check the correct interpretation and application of the recommendations and monitor any need for further additions based on user experiences.

#### Working group:

Non-public ropeways: transportation of people and goods with reversible aerial ropeways

After completing Book 11-1, the Working Group has suspended its work until the Management Committee assigns further tasks to it.

#### Working Committee n° II: Characteristics and inspection of ropes

##### Scope of the committee:

Development of technical recommendations on ropes in service and non-destructive rope testing

Current activities:

- Translation of the technical recommendation on magnetic rope testing
- Development of a recommendation on visual rope inspections
- Development of a technical recommendation on the service life of ropeway ropes

##### Members:

Expert Committee II currently has a total membership of 21 ropeway experts from eight countries from all over the world. They include representatives of supervisory authorities, operators, expert bodies and manufacturers.

#### Working Committee n° III: Electro-technical installations and components

##### Scope of the committee:

Working Committee III engages in a continuous exchange of information and experiences on the electrical equipment used in ropeways and, if necessary, draws up recommendations for OITAF or other expert committees.

The main topics covered are:

- Identification of significant safety deficiencies
- Compliance with national regulations and harmonized standards as well as their procedures, application and implementation
- Identification of technological and operational innovations and trends
- Handling of modifications to and maintenance of existing ropeways
- In-depth discussion of specific technical issues as needed

##### Members:

Expert Committee III currently has around 20 members from

five European countries. A balanced mix of operators, public authorities, supervisory bodies and manufacturers is ensured as far as possible.

#### Working Committee n° IV: Legal, administrative, economic and statistical problems

##### Scope of the committee:

- Ropeways and the EU – issues of interpretation with regard to Directive 2000/9/EC and the new Regulation (EU) 2016/424 as well as problems related to competition law
- Transnational exchange of experiences in ropeway law and economic matters
- Economic importance of ropeways – determination of economic indicators
- Issues related to the liability of ropeway companies under tort law and passengers' self-responsibility
- Inspection, control and maintenance of ropeways and their legal bases
- Quality assurance for ropeways

At present 26 experts sit on this working committee with a balanced mix of supervisory bodies, operators and manufacturers in seven European countries.

#### Working Committee n° VI: Optimization of the operation of ropeway systems

##### Scope of the committee:

- Development of recommendations on the operation of ropeway installations
- Analysis of operational issues arising at ropeway installations in relation to passengers, materials used, organization, the environment, etc.
- Analysis of malfunctions, incidents and accidents
- Monitoring the development of methods and equipment for operations, maintenance, inspections, etc.
- Preparation of proposals addressing these issues in order to solve problems or mitigate consequences

##### Members:

Expert Committee VI currently has a total of 16 members from seven countries with a balanced mix of supervisory authorities, operators and manufacturers.

#### Working Committee n° VII: Environment

##### Scope of the committee:

All environmental issues related to the ropeway industry

In detail, they comprise:

- Environmental management
- Environmental liability and environmental protection in general
- Consideration of the Habitats Directive and the Birds Directive
- Birds in the vicinity of ropeways – non-visible ropes, glass fronts of station buildings
- Climate in general – impacts on the ropeway industry
- Sustainable use of water resources
- Snowmaking systems and monitoring of snowmaking operations
- Energy efficiency in ropeway companies – carbon footprint



- Design of ski slopes taking special account of ecological aspects
- Avalanche control measures

#### Members:

In total, Expert Committee VII currently has 16 members from six countries (6 A, 2 CH, 1 D, 2 E, 2 F, 3 I) representing supervisory authorities (2), operators and manufacturers (7), universities (1), professional organizations (2) and planners (4).

#### WHAT HAS BEEN ACHIEVED BY OITAF SO FAR ?

Up to now OITAF have published and elaborated numerous recommendations and documents.

Here is the list of recommendations in effect

Book no. Title

- Book 3-1 Survey of magnetic rope testing of steel wire ropes
- Book 6 Studies on electric and electronic apparatus
- Book 7 Studies and experiments on rescue equipment for rescuing passengers on ropeways
- Book 8-2 Recommendations for the construction and operation of material handling unidirectional and reversible ropeway installations, cable cranes and material handling funiculars
- Book 9 Transport conditions on ropeways
- Book 9-1 Provisions for special transport cases
- Book 9-2 Operation in exceptional circumstances
- Book 11-1 International recommendations for the construction and operation of non-public ropeways for transportation of people and goods. Reversible aerial ropeways
- Book 12 International technical recommendations for the construction and operation of ropeways for transportation of goods with payloads up to 2000 kg
- Book 13 International technical recommendations for brakes on the winch of ropeway installations
- Book 16 Recommendations for the design and construction of conveyors intended as a boarding help for chairlifts
- Book 17 Report on the state of investigations in the field of steel ropes
- Part 1: Achievements in wire rope production
- Part 2: Achievements in the operation of wires ropes prepared in 1978/79 by Prof. Z. Kawecki and Prof. J. Stachurski
- Book 18 Recommendations for the design and construction of double monicable aerial ropeways with regard to their specific features
- Book 19 Legal glossary
- Book 20 Recommendation relating to fire prevention and control requirements to be met in operation and during maintenance of ropeway installations
- Book 22-1 Recommendation for the definition and identification of essential safety aspects of unidirectional ropeway installations
- Book 22-2 Safety aspects requiring due consideration in the safety analysis of components of unidirectional ropeway installations
- Book 23 Environmental protection responsibilities of transportation by rope
- Book 23-1 On environmental protection in the ropeway industry

Documents and guidance for good practice

- Book 24 Recommendation relating to relocation of existing ropeway installations designed to carry persons (high rope ski tows, fixed grip and detachable grip unidirectional ropeway installations)
- Book 25-1 Recommendations for the definition and identification of fundamental safety aspects of bicable reversible aerial ropeways
- Book 25-2 Recommendation relating to safety aspects requiring due consideration in the safety analysis of components of bicable reversible aerial ropeways
- Book 26 Guideline for evacuation from ropeways
- Book 26-1 Calculation method for rescue team determination
- Book 27 Hazardous scenarios requiring due consideration in the safety analysis of electrotechnical components of unidirectional aerial ropeways
- Book 28 General recommendations for the manufacturers lubrication and the re-lubrication of steel wire ropes used in ropeway installations for passengers
- Book 29 Recommendation on the planning and construction of ropeway installations designed to carry persons
- Book 30 Way of improving visual rope inspection (VI)

The various OITAF recommendations can be downloaded by members from the OITAF website at [www.oitaf.org](http://www.oitaf.org).

#### ORGANIZATION OF OITAF INTERNATIONAL CONFERENCES ON TRANSPORTATION BY ROPE

The primary objective of OITAF is the organization of the International Conference on the Transportation by Rope. Since its foundation OITAF has organized the following international conferences

- PARIS 1963 - LUCERNE 1969 - VIENNA 1975
- MUNICH 1981 - GRENOBLE 1987 - BARCELONA 1993
- SAN FRANCISCO 1999 - INNSBRUCK 2005
- RIO DE JANEIRO 2011 - BOLZANO/ BOZEN 2017

#### OITAF SEMINARS

In 1995 OITAF committed to organizing annual seminars on technical and economic aspects, on construction and operation, or on standardization and other issues related to rope transportation systems with a view to offering all interested parties, manufacturers, operators, supervisory authorities or any other party a platform for reporting on developments in ropeway transportation and discussing their own experiences.

The following seminars have been organized since 1989:

- HYDRAULIC TENSIONING EQUIPMENT FOR ROPEWAYS WITH CONTINUOUS MOVEMENT at the ETH Zurich on March 31, 1989
- NON-DESTRUCTIVE TESTING DURING MAINTENANCE OF ROPEWAYS in Vienna on April 19, 1991
- SAFETY MEASURES FOR ROPE SHEAVES OF MONOCABLE AERIAL ROPEWAYS in Zurich on April 27, 1994
- TOTAL QUALITY OF MOUNTAIN ROPEWAYS – INNOVA-



TIVE PATH INTO THE FUTURE in Munich on September 30, 1996

- RELIABILITY OF ROPEWAYS AND SAFETY REQUIREMENTS WITH SPECIAL REFERENCE TO PROGRAMMABLE CONTROL SYSTEMS in Bolzano on October 16, 1997
- ROPEWAYS AND EUROPE in Grenoble on April 23, 1998
- ORGANIZATION AND SAFETY AT WORK OF CABLEWAY TRANSPORTATION SYSTEMS in Grenoble on April 26, 2000
- EXTENT TO WHICH PRESENT DAY TECHNICAL LIMITS AFFECT THE CONSTRUCTION OF ROPEWAYS in Bolzano on October 12, 2001
- SPECIFIC LEGAL AND ECONOMIC ISSUES OF THE ROPEWAY INDUSTRY in Innsbruck (A) on October 09, 2002
- OPTIMIZATION OF ROPEWAY OPERATION in Bolzano on October 3, 2003
- OITAF ROUND TABLE CONFERENCE 2004 - DIRECTIVE 2000/9/EC: FROM THEORY TO PRACTICE in Grenoble (F) on April 22, 2004
- CHARACTERISTICS AND INSPECTION OF ROPES in Grenoble on April 27, 2006
- SAFETY OF ROPEWAY INSTALLATIONS: WHAT CAN WE DO TO REMAIN A SAFE MEANS OF TRANSPORT in Innsbruck on April 18, 2007
- THE ECONOMIC IMPORTANCE OF ROPEWAY INSTALLATIONS AND THEIR POSITION IN THE NATIONAL ECONOMY in Oslo on June 27, 2008
- EU DIRECTIVE 2000/9/EC: APPLICATION OF THE EU DIRECTIVE TO THE ELECTRICAL EQUIPMENT OF ROPEWAY INSTALLATIONS – LATEST EXPERIENCE in Innsbruck on April 24, 2009
- ENVIRONMENTAL MANAGEMENT WITHIN THE SCOPE OF ACTIVITIES OF ROPE DRIVEN TRANSPORTATION in Grenoble on April 21, 2010
- SAFETY OF TRANSPORTATION BY ROPE : LEGAL ISSUES AND ACQUIRED EXPERIENCE in Grenoble on April 25, 2012
- OPERATION OF ROPEWAY INSTALLATIONS IN EXCEPTIONAL OPERATING CONDITIONS: EXPERIENCE AND CONTEMPLATED MEASURES in Innsbruck on April 11, 2013
- MAINTENANCE OF ROPEWAY ROPES in Grenoble on April 24, 2014
- LATEST DEVELOPMENTS, NEWEST TECHNOLOGY AND LATEST FINDINGS IN ROPEWAY CONSTRUCTION in Innsbruck on April 16, 2015
- OPPORTUNITIES AND LIMITATIONS OF MODERN TECHNOLOGIES IN CONTROL SYSTEMS FOR ROPEWAYS in Grenoble on April 14, 2016
- ENVIRONMENTAL PROTECTION IN THE ROPEWAY INDUSTRY – ECOLOGICAL, ECONOMIC AND SOCIAL ASPECTS in Grenoble on April, 19, 2018
- ECONOMIC AND LEGAL ASPECTS IN THE ROPEWAY INDUSTRY in Innsbruck on May 09, 2019

#### WHAT ARE THE NEXT OBJECTIVES OF OITAF?

- Addressing technical, economic and legal issues related to ropeways;
- Providing support for the application of Regulation (EU) 2016/424 on ropeway installations;
- Taking part in the European Commission's committee on Regulation (EU) 2016/424;
- Developing and revising international recommendations for ropeways in expert committees and working groups on aspects not covered by CEN standards;
- Organizing annual seminars;
- Organizing OITAF Congress 2023.

#### BECOME A MEMBER OF OITAF,

the common forum for operators, manufacturers, supervisory authorities and persons or organizations interested in ropeways, in order to:

- contribute to shaping the future of the ropeway industry,
- have direct access to information, and
- gain a lead in knowledge.
- input your know-how
- for a top-level exchange of knowledge
- for a strong, common voice
- opportunities for informal discussions
- networking

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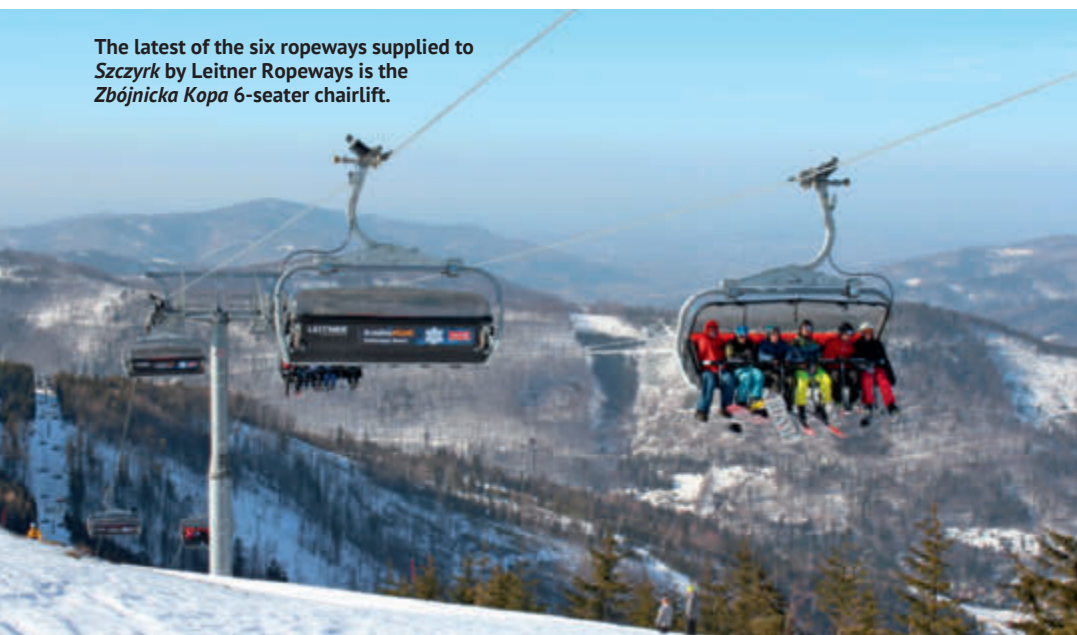
Bolzano / Bozen, May 2019

The various presentations made at the seminars can be downloaded from the OITAF website at [www.oitaf.org](http://www.oitaf.org).

# Six modern ropeways for the Polish resort of *Szczyrk*

**ISR-REPORTAGE** Since 2013 Leitner Ropeways have built five modern chairlifts and a gondola lift in *Szczyrk*, one of biggest resorts in Poland

The latest of the six ropeways supplied to *Szczyrk* by Leitner Ropeways is the *Zbójnicka Kopa* 6-seater chairlift.



## FROM SUMMER RESORT TO ALL-YEAR DESTINATION

In the 19th century the village of *Szczyrk* in the Silesian Beskids was primarily a lumberjack community, but in the 1920s Polish industrialists began to build their summer residences, villas and pensions there. That was soon followed by tourist mountain huts like the one built on *Skrzyczne* (1,257 m a.s.l.),

the highest peak in the range.

After the 2nd World War a dynamic process of development set in and the village became a popular center of tourism. In the course of these developments, the decision was taken in the 1950s to build a two-stage chairlift serving *Skrzyczne* from the center of the village. The project took several years to implement, and it was not until January

1958 that the first stage to the *Jaworzyna* mid-station was completed, followed by the second stage to the summit in December 1960. The plans and the mechanical components were supplied by VEB-Schwermaschinenbau VTA of Leipzig (East German successor to Bleichert), while the towers, ropes, chairs and electrical equipment were manufactured in Poland. That was the first chair lift to be built in Poland, and it soon led to the construction of other lifts of that type in the Polish mountains. At the beginning of the 1990s, the two stages of the single chairlift were replaced by two fixed-grip double chairlifts supplied the Polish *Mostostal* company.

## CHAIRLIFTS FOR THE CENTRAL SPORT CENTER (COS)

In addition to the two chairlifts on *Skrzyczne*, the *Central Sport Center* (*Centralny Ośrodek Sportu - COS*) in *Szczyrk* operates several surface lifts, two indoor sports facilities, a football stadium, tennis courts, an indoor swimming pool and also a boarding school for athletes, to mention just a few of its main activities.

In 2013 the *Jaworzyna – Skrzyczne* double chairlift (second stage) was replaced by the first modern ropeway in the region. This detachable quad from Leitner Ropeways has chairs with automatic restraining bars with individual footrests and yellow protective canopies. The chairs are garaged in the parking bay in the mid-station (bottom station of the second stage).

In 2017, the first stage of the old double chairlift was also replaced by a detachable quad chairlift with



The first single seater chairlift built in *Szczyrk* and the whole of Poland in 1958 serving the *Skrzyczne*.



The double chairlift from *Szczyrk* to *Jaworzyna* was in service from 1993 to 2017.

**INFO BOX**

*Tatry mountain resorts, a.s. (TMR)*, which is based in Slovakia, is a leading operator in the field of tourism in Central and Eastern Europe. The company owns, operates, co-operates or leases to other companies prominent ski areas in Slovakia, Poland and the Czech Republic – *Jasná* in the Low Tatras (SK), *Tatranská Lomnica*, *Starý Smokovec* and *Štrbské Pleso* in the High Tatras (SK), and *Špindl* in the Giant Mountains (CZ), *Ještěd* near Liberec (CZ) and *Szczyrk* in the Silesian Beskids (PL). TMR also owns and operates numerous hotels, aquaparks, golf courses and leisure parks. By the end of 2018, TMR had invested 350 million euros in its operations. The company is listed on the stock exchanges of Bratislava, Prague and Warsaw.

yellow canopies, but this one was equipped with a direct drive. The automatic underground parking bay for the first section is also located in the mid-station (top station of the first section). A *SunKid* conveyor lift provides a convenient link between the two platforms, with their slight difference in height.

In addition to red and blue trails, the black trail with FIS homologation for the downhill, slalom, giant slalom and Super-G events starts at the top of *Skrzyczne*.

In summer *Skrzyczne* is popular with tourists and mountain bikers, who can attach their bikes to the chairs of the two lifts.

**SZCZYRK MOUNTAIN RESORT**

In addition to the traditional ski area run by the *Central Sports Center (COS)* on the slopes of *Skrzyczne*, there was also a popular ski area on

the snowy northwestern slopes above *Szczyrk* operated by *Szczyrkowski Ośrodek Narciarski S.A. (SON)*. That ski area had no fewer than thirteen, mainly obsolete T-bar lifts. They were not very suitable for less experienced skiers or for families with children. There was neither a gondola lift nor a chairlift and no link between the two areas. In March 2014 *Tatry Mountain Resorts (TMR)*, the leading investor and resort operator in Central and Eastern Europe, acquired 97% of *SON's* shares with a view to investing heavily in the area. Following a preparatory phase during which the necessary permits were obtained, three new ropeways were built by Leitner Ropeways in 2017 – a 10-passenger gondola lift from the carpark to *Hala Skrzyczneńska* and two six-seater chairlifts serving *Hala Skrzyczneńska* and *Wierch Pośredni* from the *Solisko* hub further down the valley. The gondola lift serves as a feeder into the area from one of the parking lots and also as a repeat-ride system for blue and red slopes. At the bottom station of the gondola lift a multi-purpose building was constructed to accommodate various facilities. A ski school for children and beginners called *Maxiland* is located nearby. The gondola lift also operates in summer and carries numerous tourists and mountain bikers up the mountain.

The chairlifts are equipped with protective canopies, heated seats and individual footrests. All three installations are equipped with Leitner Ropeways' gearless direct drive, which guarantees reliable and low-noise running. During the first year of operation, the line of the *Solisko – Hala Skrzyczneńska* chairlift proved to be more susceptible to wind than had been as-



The bottom station of the *Szczyrk – Jaworzyna* quad chairlift is close to the center of the resort.



The first modern ropeway in the area was the *Jaworzyna – Skrzyczne* quad chairlift built in 2013.

sumed in the planning phase. For that reason, the chairs were fitted with lateral swing dampers, which

**INFO BOX**

**LATERAL SWING DAMPERS**

The swing damper mounted on the intermediate chair suspension is a tank containing an antifreeze liquid. It is square on section but curved upwards like a rocker so that when the chair swings to one side, the liquid flows in the opposite direction. That shifts the centre of gravity in the carrier and has a stabilizing effect on the entire assembly. The Leitner Ropeways swing damper thus effectively prevents dangerous rocking in chairs caused by strong or gusty winds.

PHOTOS: ROMAN GRIC (2)

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## 14 ROPEWAYS



Top station of the 10-passenger gondola lift serving *Hala Skrzyżeńska*



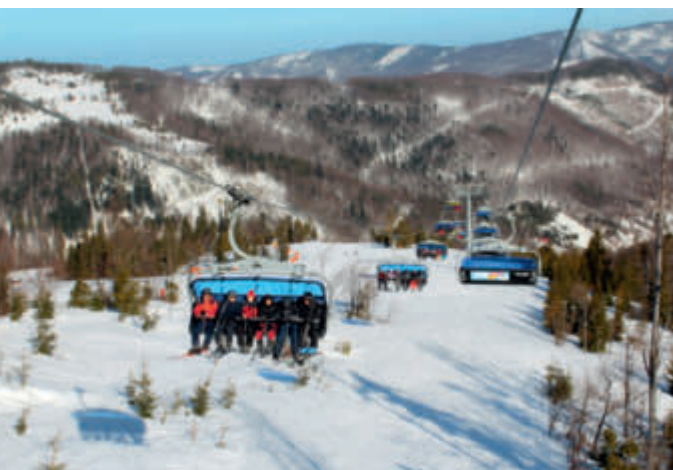
The swing damper on a chair of the *Solisko – Hala Skrzyżeńska* 6-seater chairlift



Near the top station on *Hala Skrzyżeńska* of the 6-seater chairlift from *Solisko*



Play of light on the *Solisko - Hala Skrzyżeńska* 6-seater chairlift



The *Solisko – Wierch Pośredni* 6-seater chairlift has blue canopies.

the locals dubbed “bananas”. They are an efficient solution to lateral swing caused by strong winds. Because of the additional load imposed by the dampers, one chair had to be removed from the line.

The construction of four installations by Leitner Ropeways in 2017 (the fourth was the first stage of the *Jaworzyna* quad chairlift) was the largest investment ever made in a

Polish area in a single year.

In 2018 the newest cable car was commissioned in the ski area, again a 6-seater chairlift with protective canopies, heated seats, CPS rope monitoring system and automatic restraining bars with individual footrests. It runs from the top station of the gondola lift to the *Zbójnicka Kopa* mountain, connecting the two ski areas and providing access to two blue family trails. With a line calculated to remain in the lee of the main ridge, the installation offers excellent availability in windy conditions.

As an additional – and very popular – attraction in the ski area, visitors can purchase tickets to ride in a snow groomer working on the trails.

### POLAND'S LEADING SKI AREA

With 22 km of ski slopes for all ability levels (5 km of them illuminated), a new fully automatic snow-

making system with a 100,000 cu.m. reservoir and 230 fan guns and lances, the area now known as *Szczyrk Mountain Resort* has become Poland's premier destination. In combination with the adjacent ski area operated by the *Central Sport Center (COS)* and the *Beskid Sport Arena*, the third ski area in *Szczyrk* (see *ISR 5 Country Special 2017*), visitors have access to up to 40 km of trails with a single ski pass. Two free ski bus services connect the car parks, the bottom stations of the ropeways and other hubs in the area.

In the high season, there are traffic jams on peak days on the main road through the resort. The problem is to be solved by building a ropeway serving the ski area from the central parking lot on the edge of *Szczyrk*. Constant improvements are also being made to the general tourist infrastructure in the area.

**Roman Gric**

**TECHNICAL DATA FOR THE ROPEWAYS IN**

**Quad chairlift *Szczyrk – Jaworzyna (1st stage)***

with yellow canopies, heated seats and automatic restraining bars with individual footrests

|                                    |                        |
|------------------------------------|------------------------|
| Altitude bottom station            | 541 m                  |
| Altitude top station               | 946 m                  |
| Line length                        | 1,577 m                |
| Vertical difference                | 405 m                  |
| Number of towers                   | 10                     |
| Haul rope diameter                 | 46 mm                  |
| Drive (DirectDrive)                | bottom station         |
| Rated output (starting/continuous) | 546 / 480 kW           |
| Tensioning                         | bottom station         |
| Number of chairs                   | 112                    |
| Maximum line speed                 | 5.0 m/s                |
| Transit time                       | 4.6 min                |
| Rated transport capacity           | 2,400 pph              |
| Manufacturer, year of construction | Leitner ropeways, 2017 |
| Haul rope manufacturer             | Redaelli               |

**Quad chairlift *Jaworzyna – Skrzyczne (2nd stage)***

with yellow canopies, CPS and automatic restraining bars with individual footrests

|                                    |                        |
|------------------------------------|------------------------|
| Altitude bottom station            | 949 m                  |
| Altitude top station               | 1,244 m                |
| Line length                        | 1,150 m                |
| Vertical difference                | 295 m                  |
| Number of towers                   | 11                     |
| Haul rope diameter                 | 40 mm                  |
| Drive                              | bottom station         |
| Rated output                       | 425 kW                 |
| Tensioning                         | bottom station         |
| Number of chairs                   | 83                     |
| Maximum line speed                 | 5.0 m/s                |
| Transit time                       | 3.9 min                |
| Rated transport capacity           | 2,400 pph              |
| Manufacturer, year of construction | Leitner ropeways, 2013 |
| Haul rope manufacturer             | Fatzer                 |

**10-passenger gondola lift *Szczyrk Gondola – Hala Skrzyczneńska***

with CPS

|                                    |                        |
|------------------------------------|------------------------|
| Altitude bottom station            | 592 m                  |
| Altitude top station               | 1,002 m                |
| Line length                        | 1,488 m                |
| Vertical difference                | 410 m                  |
| Number of towers                   | 10                     |
| Haul rope diameter                 | 50 mm                  |
| Drive (DirectDrive)                | bottom station         |
| Rated output (starting/continuous) | 715 / 590 kW           |
| Tensioning                         | bottom station         |
| Number of gondolas                 | 51                     |
| Maximum line speed                 | 6.0 m/s                |
| Transit time                       | 4.1 min                |
| Rated transport capacity           | 3,000 pph              |
| Manufacturer, year of construction | Leitner ropeways, 2017 |
| Gondola manufacturer               | Sigma Cabins           |
| Haul rope manufacturer             | Fatzer                 |

**SZCZYRK**

**6-seater chairlift *Solisko – Hala Skrzyczneńska***

with yellow canopies, heated seats and automatic restraining bars with individual footrests

|                                    |                        |
|------------------------------------|------------------------|
| Altitude bottom station            | 654 m                  |
| Altitude top station               | 1,003 m                |
| Line length                        | 1,615 m                |
| Vertical difference                | 349 m                  |
| Number of towers                   | 11                     |
| Haul rope diameter                 | 46 mm                  |
| Drive (DirectDrive)                | top station            |
| Rated output (starting/continuous) | 542 / 450 kW           |
| Tensioning                         | bottom station         |
| Number of chairs                   | 76                     |
| Maximum line speed                 | 5.0 m/s                |
| Transit time                       | 5.4 min                |
| Rated transport capacity           | 2,400 pph              |
| Manufacturer, year of construction | Leitner ropeways, 2017 |
| Haul rope manufacturer             | Fatzer                 |

**6-seater chairlift *Solisko - Wierch Pośredni***

with blue canopies, heated seats and automatic restraining bars with individual footrests (final design figures in brackets)

|                                    |                        |
|------------------------------------|------------------------|
| Altitude bottom station            | 655 m                  |
| Altitude top station               | 996 m                  |
| Line length                        | 1,386 m                |
| Vertical difference                | 341 m                  |
| Number of towers                   | 11                     |
| Haul rope diameter                 | 48 mm                  |
| Drive (DirectDrive)                | top station            |
| Rated output (starting/continuous) | 604 / 514 kW           |
| Tensioning                         | bottom station         |
| Number of chairs                   | 66 (83)                |
| Maximum line speed                 | 5.0 m/s                |
| Transit time                       | 4.6 min                |
| Rated transport capacity           | 2,400 pph (3,000 pph)  |
| Manufacturer, year of construction | Leitner ropeways, 2017 |
| Haul rope manufacturer             | Fatzer                 |

**6-seater chairlift *Hala Skrzyczneńska - Zbójnicka Kopa***

with protective canopies, heated seats, CPS and automatic restraining bars with individual footrests

|                                    |                        |
|------------------------------------|------------------------|
| Altitude bottom station            | 998 m                  |
| Altitude top station               | 1,204 m                |
| Line length                        | 1,691 m                |
| Vertical difference                | 206 m                  |
| Number of towers                   | 67                     |
| Haul rope diameter                 | 40 mm                  |
| Drive (DirectDrive)                | bottom station         |
| Rated output (starting/continuous) | 482 / 373 kW           |
| Tensioning                         | bottom station         |
| Number of chairs                   | 67                     |
| Maximum line speed                 | 5.0 m/s                |
| Transit time                       | 5.6 min                |
| Rated transport capacity           | 2,000 pph              |
| Manufacturer, year of construction | Leitner ropeways, 2018 |
| Haul rope manufacturer             | Fatzer                 |

# Elka combination ropeway as a major attraction for an urban leisure park

**ISR REPORT** Since 2013 a Doppelmayr combination ropeway has been in operation between two main facilities in Silesia Park in *Chorzów* near *Katowice* in Poland.

## FROM A DERELICT INDUSTRIAL LANDSCAPE TO AN URBAN RECREATIONAL AREA

1951 marked the beginning of the recultivation of a derelict landscape near *Katowice*, which was littered with spoil heaps, craters, sludge and other coal mining waste. The aim was to transform the 640 ha site into an urban recreational area with leisure, cultural and sports facilities for the workers and inhabitants of this industrial province of Upper Silesia. For the huge project, some 3.5 million cu.m. of soil was delivered to the site and almost 3.5 million trees and shrubs of 70 different species were planted. In the 1950s to 70s the area became a show-piece for the Polish regime of the time.

In the first stage of development, the *Wesole Miasteczko* amusement park, the Rosarium (rose garden), the Silesian Stadium and several refreshment facilities were built. The second stage of development included construction of a planetarium, a zoo, the Silesian Sculp-

Three stages of these chairlifts were in operation in the park between 1967 and 2006.



Whether on a chair or in a gondola, the ride on the combination ropeway at Silesia Park is a great experience.

ture Gallery and much else besides. In its heyday, Silesia Park had up to 1,300 employees, including 500 tending the trees and plants alone.

## FIRST DOUBLE CHAIRLIFTS IN POLAND

Ropeways were among the main attractions. A fixed-grip double chairlift built in three stages on a triangular layout was opened on September 7, 1967 after a two-year construction period, linking the main points of the area: the *Wesole Miasteczko* amusement park, the Silesian Stadium and the Planetarium. The system had a total length of 5.6 km, and the round trip lasted more than 50 minutes at a line speed of 1.6 m/s. That was not a disadvantage, since passengers could enjoy the beauty of the park from a lofty height of up to 15 m, especially when passing over the Rosarium and the zoo. The

three lifts – each powered by a 55 kW drive – were operated with a total of 613 double chairs for a rated transport capacity of 650 pph. All three lifts – the first double chairlifts in Poland – were built by the Polish manufacturer *Polmag*. The name *Elka* is an acronym of the Polish *Elektryczne Linowe Koleje* meaning “electrical ropeways”. The chairlifts, which only ran in summer, transported a total of 15.5 million people during their long years of service. In 1980 the original chairs were replaced by new ones. Due to the deteriorating condition of the technical systems, the 39-year-old chairlifts did not reopen in April 2006 and the decision was taken to discontinue operations.

## MODERN DOPPELMAYR COMBINATION ROPEWAY

As public response to the closure of the popular chairlifts was ex-





The station at the *Wesole Miasteczko* amusement park



The combination ropeway also passes over the Rosarium.



The basement drive is located in the *Silesian Stadium Station* and the carrier parking shed behind it.

tremely negative, various suggestions were considered for a replacement facility. Since refurbishment of the existing chairlifts would not have made sense, the construction of a new ropeway on the most important line of the former chairlifts was proposed. The necessary finance was finally obtained in the framework of the European Union's 2007–2013 *Operational Programme for the Development of the Province of Silesia*. Out of a total cost of 33.8 million Polish zloty (8.3 million euros) for the new ropeway, 23.8 million Polish zloty (5.8 million euros) was provided in the form of co-financing by the EU.

On September 8, 2013 after a six-month period of construction, a combination ropeway with fifteen 8-passenger gondolas and thirty 4-seater chairs was opened on the longest and most attractive former chairlift line between the *Wesole Miasteczko* amusement park and the Silesian Stadium. The gondolas can be used to carry wheelchairs and strollers and are also

ideal for people who do not feel at ease riding on open chairs. The stations, too, are suitable for wheelchair users. Since some of the passengers have no experience of using lifts in ski areas, the chairs have individual

footrests and the restraining bars are locked during the ride. Although the ropeway has a rated line speed of 5.0 m/s, it usually runs at 2.0 m/s, as the ride itself is the attraction. The new system is in operation all year round. The Silesian Stadium Station has a 320 kW basement drive and a parking bay for all the chairs and gondolas. The tensioning system is housed in the Amusement Park Station. There are ticket machines in both stations, and forty video

cameras are used to monitor operations.

The lift is very popular with visitors to the park: The annual visitor total can be as high as 215,000, with daily maxima of 4,500 visitors.

Roman Gric

**TECHNICAL DATA**

*Elka combination ropeway (4-seater chairs / 8-passenger gondolas), Chorzów*

with automatic restraining bars and individual footrests

|                                    |                           |
|------------------------------------|---------------------------|
| Line length                        | 2,185 m                   |
| Vertical difference                | 12 m                      |
| Number of towers                   | 11                        |
| Haul rope diameter                 | 45 mm                     |
| Drive                              | Silesian Stadium Station  |
| Rated output                       | 320 kW                    |
| Tensioning                         | Wesole Miasteczko Station |
| Number of chairs                   | 30                        |
| Number of gondolas                 | 15                        |
| Maximum line speed                 | 5.0 m/s                   |
| Transit time                       | 6.0 min                   |
| Rated transport capacity           | 860 P/h                   |
| Manufacturer, year of construction | Doppelmayr, 2013          |
| Gondola manufacturer               | CWA                       |
| Haul rope manufacture              | Fatzer                    |



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# Slovak chairlift for South Korea

**TATRALIFT** The old-established ropeway and surface lift manufacturer Tatralift a.s. completed a number of interesting installations last year. Probably the greatest challenge in terms of both engineering and logistics was the construction of a chairlift in South Korea, 8,000 km away.

Last year Tatralift a.s. built an SLO 6 detachable 6-seater chairlift in the city of Yeosu in the south of this Asian country. It is the fourth detachable installation to be supplied by the company. This is not a ropeway in a ski area, however, but a tourist facility designed to transport toboggan cars in addition to passengers. The attraction also includes a dedicated track for visitors to ride down to the valley in the toboggan cars. The cars are attached to the chairs from behind at the bottom station and removed again at the top station. All that is done in an automatic process without an attendant. This highly enjoyable summer ride doubtless has potential for operations in Europe, too. The line of the ropeway was a particularly challenging aspect of the South Korean project, as the customer wanted it to pass over an existing hotel. That made it necessary to design the towers with heights of up to 24 m. Also, due the special character of the installation, a new six-seater chairlift had to be developed in a short space time. For extra passenger safety at such a height above the ground, the suspension for the footrests on the safety bar passes between the passengers' legs.

Last year Tatralift was also successful in the field of fixed-grip chairlifts. In Tylicz in Poland, a new SLF 4p fixed-grip quad chairlift was completed with a rated capacity of 2,400 pph. The line is 364 m long for a vertical rise of 81 m. In the Russian resort of Krasnoyarsk, another SLF 4 chairlift went into service and played an important role in the Winter Universiade held



The latest installations supplied by Tatralift include the quad chairlift in the Polish resort of Tylicz.



The new detachable 6-seater chairlift in the South Korean city of Yeosu

in March 2019. In view of the need to operate the ropeway under harsh Siberian weather conditions, the 643 m long ropeway with a vertical rise of 157 m was a challenging project.

Tatralift also reports increased demand for surface lifts. In Poland, for example, two LPV surface lifts were built in the *Szczyrk Mountain Resort*. An installation of the same

type was supplied to *Ski Koryn* in *Písek* in the Czech Republic.

The longevity and reliability of Tatralift surface lifts and ropeways are reflected in their operators' interest in extending their service life. In Poland, Tatralift's engineers overhauled and refurbished surface lifts in *Zakopane* and *Jaworzyna Krynicka* as well as a chairlift in *Zieleniec*.



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# A modern 6-seater chairlift for *Kasina Wielka*

**ISR REPORT** Kasina Wielka, a winter and summer destination that is particularly popular with the people living in and around Kraków, is making big strides forward.



Bottom station of the Kasina Wielka 6-seater chairlift



The Pingwin Group now has four identical 6-seater chairlifts in its ski areas. The stations are all finished in the Group's corporate design.

Ždiar (Slovakia). Finally, Doppelmayr supplied a 6-seater chairlift with orange canopies to *Kasina Wielka* in 2016.

## TECHNICAL DATA

### 6-seater chairlift Kasina Wielka

with orange canopies

|                                    |                  |
|------------------------------------|------------------|
| Elevation of bottom station        | 610 m a.s.l.     |
| Elevation of top station           | 902 m a.s.l.     |
| Line length                        | 1,052 m          |
| Vertical difference                | 292 m            |
| Haul rope diameter                 | 42 mm            |
| Drive                              | Bottom station   |
| Rated output                       | 360 kW           |
| Tensioning                         | Bottom station   |
| Number of chairs                   | 64               |
| Transit time                       | 3.5 min          |
| Maximum line speed                 | 5,0 m/s          |
| Rated transport capacity           | 3,000 P/h        |
| Manufacturer, year of construction | Doppelmayr, 2016 |
| Haul rope manufacture              | Fatzer           |

## GOOD LOCATION, MODERN INFRASTRUCTURE

These two characteristics explain the popularity of *Kasina Wielka*, a compact ski resort only about an hour's drive (65 km) south of *Kraków*, Poland's second largest city.

Back in 1978, a 1,100 m long surface lift was built on the slopes of *Śnieżnica* by the Polish *Mostostal* company. In 2006, it was replaced by a fixed-grip quad chairlift supplied by *Tatralift*, which in turn was replaced by a high-speed detachable lift just ten years later. Following an overhaul by the manufacturer, the fixed-grip quad chairlift was relocated to the *Strachan* ski area in

The lift has a transport capacity of 3,000 pph and serves three ski trails for various ability levels. The drive and the tensioning system are located in the bottom station, while the top station has a parking bay for all 64 chairs. At the bottom station there is a ski school for beginners with a *Sunkid* conveyor lift.

Before the 2018/2019 winter season, a new snowmaking system with 20 fully automatic snowguns was installed by *Technoalpin*. The various trails in the ski area can now be covered with snow in 120 hours.

An especially popular activity in *Kasina Wielka* is evening skiing. After the end of normal skiing at 4 p.m. the trails are closed for grooming and reopened for evening skiing at 6 p.m., attracting up a thousand visitors per evening.

In the vicinity of the top station, a multi-purpose facility is now being built with a restaurant and viewing platform. *Moped Retro*, a permanent exhibition of vintage mopeds, will also open there in June 2019.

In 2017 a bike park, one of the largest in Poland, was opened in *Kasina Wielka* with nine trails for all ability levels. The bikes are transported by ropeway.

## BACKGROUND INFORMATION

### The Pingwin Group now owns five ski areas in Poland:

- *Kasina Wielka* with a detachable 6-seater chairlift with orange canopies
- *Słotwiny* in *Krynica-Zdrój* with two detachable 6-seater chairlifts with orange canopies and a capacity of 3,000 pph, built by Doppelmayr in 2016 and 2018
- *Rzyki* in *Czarny Groń* with a fixed-grip quad chairlift and a detachable 6-seater chairlift with orange canopies, both built by Doppelmayr in 2015 and 2014 (see ISR 5 Country Special 2017, Pages 8-9)
- *Skolnity* in *Wisła* with a fixed-grip quad chairlift built by Leitner in 2014
- *Kurza Góra* in *Kurzętnik*, the biggest ski area in northern Poland, with six surface lifts and a snowtubing park with seven lanes.

The latter two ski area were only recently acquired by the *Pingwin* Group. *Pingwin* also operates the *Czarny Groń* four-star hotel and spa and in summer 2019 is opening the first treetop trail in Poland in *Krynica-Zdrój*.

Roman Gric

# Innovative and flawless snow management

**DEMACLENKO** A convenient overview of the entire snowmaking system at a single glance: this is what Snowvisual 4.0, Demaclenko's fully automated operating software, stands for. Thanks to continuous optimization, it is a unique tool for snow and slope management in winter resorts and was presented at Interalp with further innovations.

With Snowvisual 4.0, Demaclenko offers ski resorts the most effective tool for fully automatic snowmaking systems operation. All the system data and components are accessible via a single intuitive platform, delivering detailed reports and statistics to optimize snowmaking processes. Other helpful functions such as snow depth measurement show precisely which sections of which slopes require more snow. The software guarantees maximum compatibility and bundles all the elements relevant for snowmaking in a single powerful and compact system.

## ECONOMICAL, SUSTAINABLE AND EFFICIENT USE OF RESOURCES

Digitalization has enormous potential, particularly for ecological aspects of snowmaking. That is why Demaclenko is consistently working to improve the sustainability of its products and solutions. The resource management component of Snowvisual 4.0, which is at the cutting edge of technology, plays a role in this respect through optimum regulation and monitoring of the use of resources. For instance, when managing water, the software monitors how much water is effectively available for snowmaking before it activates the snowmaking system. As a result, the capacity of the pumping station and the number of snow guns in use is automatically adjusted for the best possible results with maximal efficiency.

Further undreamt-of prospects are opened up by the power management component, which precisely monitors the performance of the

snowmaking. Power consumption smoothing helps reduce short-term electricity peaks, thereby saving energy and costs. Developments are also moving in the direction of a power management system that covers entire areas, monitoring consumption on the mountain and regulating it through priority management. Here, customers benefit from the bundled capabilities of the Leitner group, which also offers the latest generation in complete packages and cross-cutting solutions for ropeways and snow groomers.

## DIGITAL EXTENSIONS: METEO-APP AND SKIFLOW

Two new helpful tools have been added to Demaclenko's digital product range and are now available, offering ski resort operators additional advantages in their daily work.

**Meteo-app:** predicting and making optimum use of windows of opportunity for snowmaking. The ability to plan snowmaking processes with precision is becoming more and more important, with today's increasingly shorter windows. New standards have been set by the innovative Meteo-app developed within the HTI group. Snowgun records of present and past temperatures and humidity are combined with general meteorological models. A decisive factor is the predicted wet-bulb temperature displayed for the following ten days, making it possible to determine the windows of opportunity for snowmaking with precision. This method factors in uncertainties in the general weather forecast, which is why it is the most reliable resource on the market for snowmaking planning.



## SKIFLOW: MONITORING SLOPE USE IN REAL TIME

Do you want to know how many people are on the slopes at any time of day? SkiFlow makes that possible. This system of sensors developed by Demaclenko is linked with Snowvisual and can be directly integrated into a snowgun or weather station, for instance. It counts the number of passing skiers and shows slope use in real time. That offers several advantages:

- Safety on the mountain: monitoring the use and overcapacity of the slopes and checking whether anyone is on a trail at any time
- Planning and optimizing slope grooming: quickly identifying the sections of the slopes that have had most use in the course of the day
- Help in deciding where to invest: determining the most popular slopes and optimizing the resort's offer accordingly
- Added value for visitors: using an app to permit visitors to see which slopes are currently busiest

Demaclenko is an expert in digital snowmaking



**Royal Ride:** On the open-air balcony of the panorama cabins of the *Wengen-Männlichen* aerial tramway passengers “ride” like a coachman to the “Realm of the Männlichen”.

# The people for fine design

**CARVATECH** The innovative panorama cabins with open-air balconies for the *Wengen-Männlichen* aerial tramway, the futuristic *Tschuggen Express* in Arosa, the reversible aerial tramway cabin for the *Falginjochbahn* on the Kaunertal glacier, the cars for the *Cable Liner Shuttle* at London Luton Airport or for the *Wurzeralm* funicular – wherever you look, the Upper Austrian company demonstrates its flair for elegant design.

According to Carvatech’s Managing Director Robert Vockenhuber, it is not the standard product but innovation that drives the company, and last year this strategy proved successful once again: “2018 was a very good year for Carvatech; we were operating at full capacity. We are particularly pleased that we were able to implement a number of flagship projects in Switzerland. One of them was certainly the panorama cabins with open-air balconies and spiral staircases for the new *Wengen-Männlichen* aerial tramway.”

## 2018 IN RETROSPECT

Visitors get a “flying in the wind” feeling as they soar up from Wengen to the Männlichen on the open-air balconies installed on the roofs of the elegant panorama cabins. The ride on the reversible aerial tramway is an experience in its own right, and that was precisely the aim of the operators of the refurbished *Wengen-Männlichen* aerial tramway in Canton Valais. As this was an existing installation, the new cabins had to be designed for a maximum total weight not exceeding that of the old ones. Access to the open-air balcony is via a spiral staircase in the cabin. Both the balcony and the staircase can be quickly and easily dismantled. A key factor for the design of the cabins was coordination with the operating company’s *Royal Experience* marketing concept. That explains the choice of royal crimson with gold for the exterior. The passenger compartment with integrated attendant’s stand is finished in a light color.

As a further highlight of the year in Switzerland, Carvatech supplied the cars for the *Tschuggen Express*, which carries guests of the *Tschuggen Grand Hotel* straight up to the Arosa-Lenzerheide ski area. Vockenhuber explains: “The design of the cabins for the funicular reflects the luxurious standard of the *Tschuggen Grand Hotel*. We made the most of a challenging design brief, including cabins with automatic



The *Tschuggen Express* by night

PHOTOS: LUFTSEILBAHN WENGEN-MÄNNLICHEN AG, STEUERER SEILBAHNEN AG (1)



Rendering of one of the two trainsets for the DCC Cable Liner at London Luton Airport

leveling and limited space in the stations, to develop a timelessly elegant solution.” A special feature of the funicular is the use of two coupled cabins so that the system operates as if with a single car, which adapts flexibly to changing line parameters and so provides a particularly comfortable ride.

In 2018 Carvatech also supplied four elegant cabins in classic design for the two stages of the new *Stalden-Staldenried-Gspon aerial tramway* in Canton Valais (s. ISR 2/2019, p. 38).

In Austria, the company manufactured aerial tramway cabins for the new *Seefeldler Jochbahn* in the Tyrol, the *Feuerkogelseilbahn* in Upper Austria and the *Untersbergbahn* near Salzburg. For the two latter, weight limitations were a major issue, as the cabins were ordered for existing installations. In addition, the cabins are used not only to carry passengers but also for other transport operations, as Vockenhuber explains: “For the *Feuerkogel cable car*, for example, hang glider transportation was a specification, and for the *Untersberg cable car* snow clearance in the mountain station with special snow blades had to be provide for, to name just a few of the diverse transportation requirements. Thanks to our design engineering skills, we were able to optimize the cabins and comply with the weight limits.”

Carvatech was particularly pleased to be able to equip the new *Natronbahn* and the new *Sonnbergbahn* operated by *Aberg-Hinterthal-Bergbahnen AG* in Maria Alm am Steinernen Meer with its C10 continuous-movement gondola lift.

#### OUTLOOK ON 2019

2019 has also got off to a very good start for Carvatech, as Managing Director Vockenhuber says: “Our order books are full. We are currently manufacturing the cars for the two trainsets for the Cable Liner, which Doppelmayr Cable Car (DCC) is building for *London Luton Airport* between now and 2021.” At the airport, passengers coming from London St. Pancras International to Luton will in future travel the final leg on the new DCC Cable Liner instead of the bus. At present, Carvatech is also producing the two cars with six compartments each ordered by *Hinterstoder-Wurzeralm Bergbahnen AG* for the *Wurzeralm funicular*, which is due to go into service in 2020. Another highlight of the year is the *Design G* aerial tramway cabin (100 + 1 persons) being built for the new *Falginjochbahn* on the

Kaunertal glacier. Alfred Gufler, project manager for Doppelmayr Italia, explains: “This is a twin-track Funifor facility, but at the moment the ropeway engineering equipment is only being installed on one track. The new *Falginjochbahn* spans an avalanche slope and replaces a double surface lift, for which the operating permit has not been extended because of the danger of avalanches. The bottom station of the Funifor is located at 2,748 m a.s.l. and the top station at 3,113 m a.s.l. Commissioning is scheduled for late autumn 2019. Doppelmayr Italia very often comes to Carvatech for large cabins, and we particularly appreciate the company’s flexibility.”

Claudia Mantona

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Planning - Geo-engineering - Site supervision  
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Environmental mediation

# The ropes used on ropeway installations



In response to a suggestion received from the ISR readership, we are publishing an ongoing series of articles devoted to the basics of ropeway engineering, which Professor Josef Nejez writes for those readers who have no relevant engineering background.

UNIV.-PROF. DIPL.-ING. DR. TECHN. JOSEF NEJEZ  
Technical editor of ISR

**IN THE FIELD OF ROPEWAY ENGINEERING**, apart from low-level ski tows with synthetic ropes, installations operate with *steel wire ropes* of various types depending on their function within the system.

A wire rope as used on ropeways is a structural component of varying length comprising a large number of steel wires twisted around the axis of the rope to form a helix. The wires are made of high-strength steel. The tensile strength of the steel used for such applications is between 1570 and 2160 N/mm<sup>2</sup>. The rope, as a construction of helically wound wires, can absorb high tensile forces and – in contrast to a steel rod with the same cross-sectional area and the same strength – offers a degree of flexibility because the individual wires have a certain freedom of movement relative to one another. That permits the ropes to lie flat on the curved surface of a rope shoe, to be wrapped around an anchor drum and to pass smoothly over rope sheaves and around bull wheels.

Depending on the function of the rope within the system involved, it must be designed to meet a number of different requirements and withstand a variety of loads.

As already discussed on page 59 of ISR 1/2018, a *bicable ropeway* is one in which the carriers have a carriage which travels on a stationary *track rope* and is propelled by a moving *haul rope*. In the case of a *monocable installation*, the carriers are simultaneously supported and propelled by a *carrying-hauling rope*. Track ropes and haul ropes have quite different functions, while carrying-hauling ropes combine those functions in a single rope. In terms of rope construction, however, no distinction is made between haul ropes and carrying-hauling ropes.

Track ropes must be able to withstand high tensile forces and support high individual carrier loads, but they do not move (anchor drums) or only slowly at a given curvature (track rope shoes, roller chains). Track ropes can therefore have a high bending stiffness and require a compact cross-section in order to withstand transverse forces. In the case of haul ropes and carrying-hauling ropes, the tensile stresses are somewhat lower, as are the bending stresses resulting from point loads (rope sheaves, vehicle grips), but the bending stresses at a given curvature call

for ropes with low flexural stiffness, e.g. for rapid passage over the rope sheaves. This can be achieved by inserting a soft core into the cross-section of the rope.

## ROPE CONSTRUCTION

As mentioned above, ropes consist of a large number of wires which are helically wound (or laid) around the longitudinal axis of the rope. The direction in which the wires are wound is called the *direction of lay* and can be right-hand (clockwise) or left-hand (counterclockwise).

As a result of the different requirements and loads acting on the ropeway ropes, there are basically two types of rope construction, *spiral ropes* and *stranded ropes*.

In spiral ropes, the wires are wound in several layers around the longitudinal axis. All the wires thus have a simple helical shape in the rope. The direction of lay of the wires alternates between successive layers.

In stranded ropes, it is not the individual wires that are wound around the longitudinal axis but the strands, which themselves consist of wires wound around the axis of the strand. That gives the wires the shape of a double helix: First they are wound around the strand axis and then they are wound within the strand around the rope axis.

The rope constructions available for both spiral and stranded ropes vary considerably depending on whether profiled wires and/or round wires of the same diameter and/or round wires of different diameters and/or different cores are used.

## TRACK ROPE CONSTRUCTIONS

On the left of Figure 1 is the cross-section of a *multilayer stranded rope of equal round strands* comprising several layers of simple round strands. The round strands themselves consist of round wires. This track rope construction is also known as a *Herkules rope*. The rope has a compact cross-section and approximates well to a cylindrical shape but has a relatively uneven surface (a cause of roller lining wear on the carriages of the carriers). That is one of the reasons why only *full-locked coil ropes* may be used as track ropes on new installations today. On the right of





Fig. 1: Cross-sections of track rope constructions, with a multi-layer stranded rope of equal round strands (Herkules rope) on the left and a full-locked coil rope on the right

Figure 1 is a full-locked coil rope with two layers of round wires, one layer of filler wires (no load-bearing function) and two layers of Z wires. Full-locked coil ropes have a very compact cross-section and a smooth surface, which makes them ideal as a track for the carriages of ropeway carriers.

**HAUL ROPE CONSTRUCTIONS**

In the upper half of Figure 2 is the cross-section of a six-strand round strand rope with a soft core, as used for haul ropes and carrying-hauling ropes. The soft core gives the rope the flexibility required for fast running over the rope sheaves. The strands are made of round wires of different diameters. The various wire diameters are selected to ensure that the wires fill out the strand cross section and that they are in line contact in the longitudinal direction (parallel closing).

The four standard strand constructions are shown in diagrammatic form in the lower half of Figure 2:

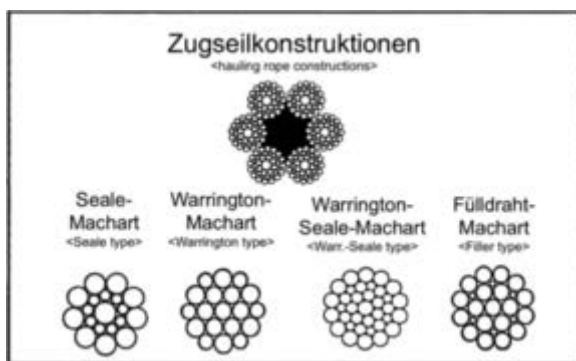


Fig. 2: Cross-sections of haul rope constructions, with a six-strand round strand rope with a soft core at top and four standard strand constructions at bottom

- Seale construction: the two layers of wires have different

wire diameters.

- Warrington construction: there are different wire diameters in the same layer of wires.
- Warrington-Seale construction: a combination of the first two.
- Filler wire construction: thin wires fill out the main voids in the cross-section and support the thicker wires.

In the case of stranded ropes, a distinction is made between two types of lay depending on the direction of lay of the strands in the rope and of the wires in the strands:

- Lang's lay: the direction of lay of the wires in the strands is the same as the direction of lay of the strands in the rope
- Ordinary lay: the direction of lay of the wires in the strands is opposite to the direction of lay of the strands in the rope

For haul ropes and carrying-hauling ropes, Lang's lay ropes are normally used because their lower bending stiffness compared to ordinary lay ropes makes them better suited for fast running over the sheaves.

The soft core, e.g. a synthetic rope, supports the strands and facilitates smooth running over the sheaves.

The core material and the way in which the strands are bedded about the core during manufacture have a significant influence on rope service life and elongation.

Ordinary lay ropes are used as tensioning ropes. Due to their more compact construction, they are capable of withstanding high transverse loads on the counterweight or tension sheaves.

**ROPE STANDARDS**

The following European standards apply to the ropes used on ropeway installations:

- European steel wire rope standards in the series EN 12385: *Steel wire ropes – Safety*. They specify requirements relating to the materials, construction, manufacture and testing of steel wire ropes.
- European cableway standard

EN 12927: *Safety requirements for cableway installations designed to carry persons – Ropes*. In the last revision, the eight parts of the original standard were combined into a single document (for the details see the BMVIT article on page 6 of ISR 4/2017).

The article planned for ISR 4/2019 will be devoted to rope connections and terminations.

Josef Nejez

GRAPHICS AND PHOTO: ARCHIVE OF J. NEJEZ

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# Two records in Poland and Serbia

**NEVEPLAST** Record-breaking installations: the longest artificial ski slope in Europe in Kopaonik and the largest summer–winter tubing park in the world in Kurza Gora.



In Kopaonik, Neveplast has developed the longest artificial ski slope in Europe.

**T**he challenge ski resorts have to face, particularly in recent years, is to remain competitive and attractive all year round, even after the end of the winter season.

Shorter and shorter winter seasons and poor snow falls have triggered the increasingly widespread tendency of ski resorts to seek tourism services that offer an alternative to traditional winter sports.

While remaining their core business, winter skiing is therefore being joined by other complementary activities.

Neveplast, the market leader for artificial ski slopes, effectively interprets market needs in the individual case, anticipating future moves and offering ski resorts valuable tools that are educational and sporting, thus increasing the choice available to a large visitor segment and supporting year-round operations.

## EUROPE'S LONGEST ARTIFICIAL SKI SLOPE IN KOPAONIK, SERBIA

The well-known tourist resort of Kopaonik has added to its skiing facilities with the opening of a Neveplast slope, at 750 meters the longest artificial ski slope in Europe.

The track can be used both in summer and in winter and offers a fine skiing experience for both experts and beginners. A great success with the public as soon as it opened, it is also a big hit with the operators, who now have a competitive all-year ski resort.

With its 55 km of slopes, Kopaonik is the largest ski resort in Serbia and a very popular tourist destination both in winter and summer thanks to the wide and varied amenities and services provided.

Built in Kopaonik National Park, the ski center recently opened the longest artificial ski run to be built in Europe so far, with Neveplast as one of the main suppliers. With a length of 750 meters and 116 meters of vertical, the ski run is suitable for both beginners and experts who want to enjoy their sport even when there is no snow. The Neveplast slope in Kopaonik is in all respects a real ski run, like those in the big resorts in the mountains. Designed and developed in accordance with traditional standards of quality and safety, it is served by a 4-seater chairlift. Also, as a project designed to reduce management and maintenance costs, the track is now the jewel in the crown of the Kopaonik ski resort. Since it was opened, the new facility has been used by hundreds of skiers of all ages: beginners, experts and professionals, all waiting for the next winter season.

## THE WORLD'S LARGEST SUMMER-WINTER TUBING PARK IN KURZA GORA, POLAND

Neveplast has chalked up yet another record. Following the installation of Europe's longest artificial ski slope in Kopaonik, the Italian company has now developed the world's largest summer-winter tubing park in Kurza Gora.

The attractive ski area of Kurza Gora, among the best equipped in the northernmost region of Poland, has decided to invest in an amazing tubing park, which will be open in winter and in summer as a driving force to promote the tourist destination all year round.

The tubing park is impressive for its size and the revolutionary design of the tubing tracks which ensure fun and entertainment for users on the one hand and an exceptional hourly capacity and increased financial benefits for the operator on the other.

The tracks have a total length of 700 meters, divided into three 124-meter straights with rapid acceleration at the start that is reduced during the descent, a 134-meter track with thrilling parabolic turns, and a tubby jump with an innovative landing system that allows you to slide out directly from the big air bag once you have landed without having to get up and walk.

Last but certainly not the least spectacular of the new features, the layout includes a double track with separate trajectories that intersect in the proximity of a tunnel where one track crosses over the other on an elevated section, resulting in an extraordinarily scenic effect.

# Autonomous blade for snow groomers

**PRINOTH** A technical innovation from the South Tyrolean snow groomer manufacturer Prinoth has the potential to revolutionize slope preparation: an autonomous blade that automatically follows the relief of the terrain. The patent application has been submitted<sup>1</sup> ...



Prinoth snow measurement display

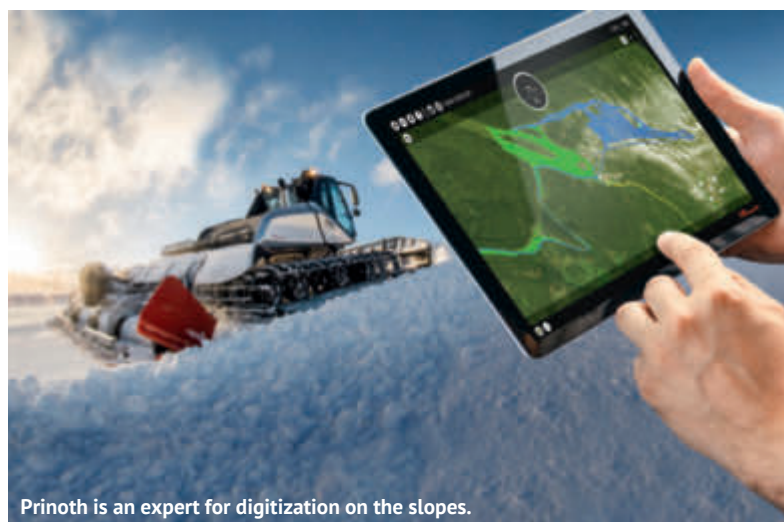
greatly simplified. The 3D model of the halfpipes, jumps, etc. is simply imported into the system, and the operator can follow the profile in real time on a display in the cab.

## THE AUTONOMOUS BLADE MAKES CHILD'S PLAY OF SNOW GROOMING

Digitization on the slope does not stop with Snow How: Prinoth has come up with a new technology to make the work of the groomer operator even easier! The latest highlight: an autonomous blade! Leica Geosystems' precise terrain surveying, which is already used for snow measurement, provides the basis. The operator can program the desired snow depth and terrain profile in advance and switch on the automatic blade guide via the keypad. The program then shows the relief of the terrain and the snow depth in real time, and the blade automatically follows the relief. All the driver has to do is steer. The result is razor-sharp precision - and optimum handling of the snow inventory.

The autonomous blade is currently being tested in 24 ski resorts, and the first reactions are euphoric. The project is still in the test phase because, as always, Prinoth is working on the product all the way to absolute perfection.

In addition to Prinoth's unique parallel tiller displacement, the technically unsurpassed Automatic winch and the efficient sliding seat, Prinoth is again setting a new milestone in innovation and technology and confirming its position as one of the unrivaled technology leaders in the industry.



Prinoth is an expert for digitization on the slopes.

## DIGITIZATION ON THE SLOPES

Prinoth's Snow How system already helps ski resorts all over the world to achieve savings of up to 20% and is a source of great enthusiasm among resort and ski area managers and their technical personnel. This system is one of the most accurate snow depth measurement systems on the

market, providing precision measurement to within 2 cm plus an overview of the entire groomer fleet data in a convenient and user-friendly program: A single click is all it takes, and the user has an overview of all the snowguns with their data and snowmaking performance. As a result, difficult grooming work, e.g. snow parks for the freestyle scene, is

<sup>1</sup>) Registered at the Italian Ministry of Economic Development under the number: 102018000010464

# The PistenBully turns 50!

**KÄSSBOHRER** The PistenBully adventure began a good 50 years ago on the Seiser Alm in South Tyrol. Half a century later, the company from Laupheim, Germany proudly looks back at a unique success story – a story that is far from over. An anniversary worth celebrating!



At PistenBully, "Freundschaft" ("friendship") has been front and center all along.

## JUST FOR THE FUN OF IT

In 1967, nature lover Karl Kässbohrer spent his annual ski vacation on the Seiser Alm in South Tyrol, Italy. He was running the company, then known as Kässbohrer Fahrzeugwerke, together with his brother Otto. At that time, they were one of the most successful manufacturers of buses (Setra) and utility vehicles with 5,000 employees worldwide.

But what was it that inspired this Swabian tinkerer to develop a snow groomer? While up on the Seiser Alm, Kässbohrer had seen all kinds of do-it-yourself slope grooming equipment in use. He knew his company back home in Ulm could do better. Ambition was roused. Apart from that, for once he wanted "to develop a vehicle designed solely for enjoyment and pleasure". And that is exactly what he did.

## NO HOLDING BACK

Just two years later in 1969, the first PistenBully was ready. The innovative features were the diesel engine and hydrostatic drive. The success story took its course. To

Kässbohrer snowmobile – KSM 001  
Sparking idea: the first prototype with the hydrostatic drive lined up for a test run at the end of 1968 ...



date, over 22,000 PistenBullys have been delivered worldwide. The name PistenBully became both a brand and generic term for snow groomers in general.

## ALWAYS AT THE SERVICE OF THE CUSTOMER

From the original idea of developing a vehicle for enjoyment and pleasure, a globally active but still close-knit family-run company with over 600 employees has grown. PistenBully has defined the snow groomer like no-one else – always in close coordination with its customers. The new PistenBully 600, featuring assistance systems and the highest level of operator comfort, is the cleanest and quietest vehicle on the market today.

With it SNOWsat, PistenBully offers a proprietary professional slope and fleet management system that includes snow depth measurement. SNOWsat will also accompany PistenBully on its road into the future. Soon there will be a system available to customers that gathers, analyzes and processes the enormous amount of

.. and peppered with innovations as usual – the new PistenBully 600



relevant data at the ski resort – for the benefit of customers and skiers.

## SOMETHING TO CELEBRATE

The company is celebrating this special anniversary with its customers, employees and the entire global organization. And Kässbohrer know how to celebrate, as they have repeatedly proved: Events are planned throughout the year at several locations – on the mountain in various countries, at the InterAlpin trade show in Innsbruck, Austria, and at the new

logistics center in Laupheim. In 2019 there will be surprises the whole year round that have not yet been disclosed. Definitely something to look forward to!

**A WELCOME FOR THE STARS OF WINTER SPORTS IN LAUPHEIM**

Laupheim will be the venue for a very special event in 2019: In Octo-

ski teams. On that day, all the alpine skiers, biathletes, cross-country skiers and nordic combined athletes, freestylers and free skiers as well as ski jumpers and their teams will be there. Having such an important event take place at the Kässbohrer facility during their ju-

read about the history of PistenBully, who they are today and how they are preparing for the future in Laupheim. The anniversary website is presented under the motto "50 years of friendship by PistenBully". All PistenBully fans and friends can immortalize them-



The retro collection is a must for passionate PistenBully fans.



ber of the jubilee year, Kässbohrer Geländefahrzeug AG will be hosting the DSV Einkleidung (outfitting event for the German national squads), which marks the beginning of the competition season every year for the German national

bilee year is definitely a feather in their cap! PistenBully is celebrating its jubilee not only offline but also online: [www.50years.pistenbully.com](http://www.50years.pistenbully.com) offers a colorful picture of five exciting decades. Visitors to the site can

selves with a photo in the Friends Book. In return, a special jubilee PistenBully polaroid can be downloaded as a special souvenir.

**IMPRINT**

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# A matter of great importance

**KÄSSBOHRER** For PistenBully, clean mountains are a prime concern.



PistenBully 600: the very first to meet EU Stage V



PistenBully 100: on track for harmony between nature and technology

For innovative and forward-looking ski resorts, an environmental orientation is a big selling point for visitors. The dilemma is well known: On the one hand, winter tourism is the source of people's livelihood in many regions and on the other hand, there is room for improvement in the image portrayed in the media. Kässbohrer is joining the quest for the highest possible level of environmental protection and setting standards for emissions. The new PistenBully generation uses the cleanest engines available on the market.

## THE LOWEST EXHAUST EMISSIONS POSSIBLE

Kässbohrer takes environmental protection very seriously, and the cause has been taken up in its BlueIQ corporate strategy. Here the emphasis lies on slope management that is efficient and minimizes the use of resources. In addition to the SNOWsat and PRO ACADEMY, this also contributes to the lowest emission values on the mountain. The engineers at Kässbohrer were first movers with the new PistenBully 100, which was launched with its future-proof engine in 2017 already. At that point, the diesel particulate filter was only available as an option. At the begin-

ning of this year, however, it became standard, thereby fulfilling EU Stage V.

## FIRST PAST THE LINE WITH EU STAGE V

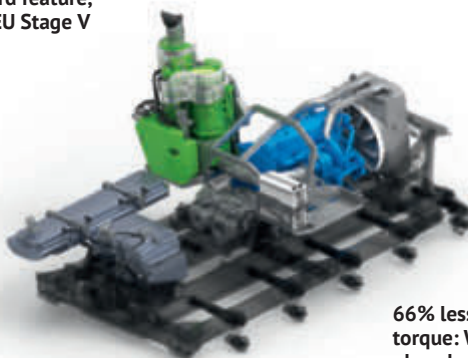
With the especially quiet and clean 6-cylinder engine, the PistenBully 600 is setting new standards in sustainability with its market launch as the first snow groomer with an EU Stage V engine. The result is an impressive combination of exciting performance and environmental conservation.

## RESPONSIBILITY FOR THE ENVIRONMENT

The people at PistenBully are clearly well aware of their pioneering role. Exceptional vehicles using the cleanest engines provide support to ski resorts in their sustainability policies and measures. That is also about meeting today's demands of vacationers in terms of environmentally sound tourism.



PistenBully 100 diesel particulate filter: Installed as a standard feature, it brings the engine up to EU Stage V



66% less particles, 80% less nitrous gases, 8% higher torque: With the new PB 600 engine, greater value is placed on environmental performance.

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# None is cleaner

## The new PistenBully 600

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### Product highlights in its class:

Lightest machine for superior climbability

Cleanest and most quiet engine (EU stage V)

Best power-to-weight ratio

Greatest payload

Most intuitive and comfortable control

Most reliable winch

