Fig.7-1 The release of the JNR KIHA20 diesel car contributed to the popularization of N-gauge model railroading because modelers could enjoy it on its own as a motorized car. In spite of the non see-through body of the motorized car, the application of a new high-performance drive unit whose performance had been verified in the improved Series 103 commuter train provided smooth and stable operation along the steep slopes and curves of countryside decorated layouts.

Fig.7-2 In 1971 the JNR C11 model was the second steam model released by Kato, more than three years after the discontinuation of production of the C50, the first N-gauge model in Japan. In the C11, the motor was changed from the "Midget motor" to the SM-5, as well as a change of body and drive parts (cf. Section 6.7(7.2), Chapter 7). Before the development of optional plastic number plates in the latter half of the 1970s, a sticker of printed number plates was included. This was true also for the steam locomotives JNR C62 and D51 in their early productions. The C11 has been produced for a long period of time, each time with small improvements and modifications.

Fig.7-3 In 1975, ten years after the first N-gauge model, the model of the Series KIHA82 limited-express diesel train was developed. The model provided the foundation for the structure of many N-gauge models today with fitted windows, operating headlight and room lights, and color lines reproduced by tampo printing. This would also be the first time that a detailed interior would be attempted on a motorized model, with the dining car KISHI80 with a smaller number of windows being selected because of the imperfect see-through performance of the FM-5 motor (cf. Section 6.7(7.2), Chapter 7) being used at that time.

Fig.7-4 The modified drive unit from the 1980s adopted the smaller motor GM-5 instead of the FM-5, keeping the driving structure with universal joints connecting the motor shafts and trucks unchanged. This move to a smaller motor allowed for a drive unit of a smaller height, and the normal-class car KIHA80 instead of the dining car KISHI80 was able to be selected for motorization without impacting the appearance of the interior in the car. The selection of motorized KIHA80 made it possible for a train composition lacking the dining car as was already popular even in the limited-express trains at that time.

Fig.7-5 In 1977, the long awaited first model of the diesel locomotive JNR DD13 was released. This early model was equipped with an "Automatic uncoupling coupler", where uncoupling was possible by the use of a magnetic uncoupling device installed on the track.

Fig.7-6 For the production of the JNR DD13, the most important subject was to develop a drive unit that was small enough to fit into the narrow inner volume of the bonnet. For this purpose, the SM-5 motor which was originally developed for the steam locomotive D51 with a small cab, was used by modifying it from a single shaft to double shafts.

Fig.7-7 The JNR EF65 1000 and Series 24 Type 25 sleeping cars were bestselling models during the "Blue train boom" which began in the middle to late 1970s. A new method of inserting separated parts in the body was applied to the EF65 1000 to allow for a sharp boundary between different colors and for selectable number plates. The usefulness of this method had been already tested on the JNR EF66 released one year prior.

Fig.7-8 The "Salon Express Tokyo" was one of the earliest "Joyful Trains" produced before the breakup and privatization of the Japanese National Railways and it attracted much attention at that time. To make precise models of the train, special attention was paid to the reproduction of the interior which could be seen through the large windows of the end car.

Fig.7-9 In 1985, a set of the "Salon Express Tokyo" with the JNR EF58 61, the direct-current electric locomotive dedicated to pulling the imperial train, was prepared in order to celebrate the 20th anniversary of KATO N-gauge production. At the same time, a set consisting of a C50, the improved second generation model, with a classic combination passenger car OHANI30 decorated with a 20th anniversary symbol was released with a paper package designed to resemble those used on early products.

Fig.7-10 The first coupler with variable coupling distance in Japan was introduced with the "Salon Express Tokyo". A simple mechanism around the truck-mounted coupler and its pocket allowed the coupling distance to extend from the more prototypical short coupling length when the train went into a curve from a straight. Couplers like this have been in constant development to this day, constantly being improved.

Fig.7-11 The high-performance of a drive unit coupled with flywheels was proven for the first time in the GP38-2, an export model to the U.S. In 1989, flywheels were integrated into the JNR EF81 dual-current electric locomotive and the use of flywheels in Japanese prototype models became more common. As a result, flywheel equipped drive units became standard not only for electric and diesel locomotives, but for electric cars and steam locomotives as well. A high degree of precision was necessary when machining the flywheels in order to ensure stable operation.

Fig.7-12 The pendulum system was first introduced in Japan with the JNR Series 381 "Shinano" limited express direct-current electric train. The passive system for the Series 381 prototype was changed to the active system to prevent motion sickness of passengers, and the system is applied to many limited-express trains today. In models to simulate the pendulum system, the structure of the passive system was applied, for the first time, to the JR East Series 351 "Azusa" limited-express direct-current electric train, followed by iterated improvements of the structure.

Fig.7-13 The inclined body of the E351 train along the curve is obvious even at the small size of N-gauge.

Fig.7-14 The coupling of a JR East Series E2 Type 1000 "Hayate" Tohoku-Shinkansen train and a JR East Series E3 "Komachi " Akita-Shinkansen train.

Fig.7-15 The "Open-nose coupler" for Shinkansen trains precisely reproduced the function of the prototypes, where the nose of the front car was opened by the operation of a lever located at the bottom of body, and the separated nose halves were moved horizontally to expose the built-in coupler.

Fig.7-16 For the model of the Toyama Light Rail TLR0600 "Portram", the development of a see-through body combined with a drive unit became the biggest challenge.

Fig.7-17 The parts composing the drive unit of a "Portram". Besides the completely different structure and configuration of the relevant drive unit from existing ones, there are many fine parts with one-order smaller dimensions compared to existing drives. It is appropriate to say that the parts for this newly developed drive unit are similar to those used in watches.

Fig.7-18 The styles and colors of JR East Series E5, E6 and E7 Shinkansen trains ware reproduced precisely as N-gauge models.

Fig.7-19 JR East Series E655 dual-current electric cars are operated as an imperial train and as trains for tour groups planned by either JR East or travel agencies. When making this model, a total of six cars were produced, including a special imperial car.

Fig.7-20 The special imperial car was sold separately from the 5-unit train set as a separate release. The biggest challenge when producing these models was the reproduction of the prototype's paint whose color tone could vary depending on the viewing angle.

Fig.7-21 The Rhätische Bahn (RhB) running along the mountain route in Switzerland is very famous scenic railway. The use of a 1/150 scale instead of 1/160 for the models of this "meter-gauge" train resulting in slightly smaller bodies than those of the standard gauge reflected the assertion by the present manufacturer to produce models of Japanese prototypes which have dimensions similar to the RhB.

Fig.7-22 Old electric cars operated in Iida lines have unique styles. After being used for many years across different areas in Japan, details became different for each individual car despite being built to the same original style. Models prepared for the individual car numbers reproduced the details of their prototype exactly.

Fig.7-23 N-gauge trains produced under the common theme of the "Iida line". The concept of the program indicating a new direction for the development of N-gauge products was started recently accompanied by the production of models for the Rhätische Bahn (RhB).

Fig.7-24 A C12 model with an accurate prototypical appearance was made possible through the use of a coreless motor developed by KATO. Because of the small number of wheels, stable power collection became a key problem to be solved. By utilizing new spoke wheels that could collect power on both the leading and trailing wheels, the C12 showed superior running performance never before realized in a small steam locomotive.

Fig.7-25 The JNR C59 steam locomotive model has the details and running performance of a standard level today, reflecting the technologies and experiences in the production of N-gauge models accumulated in the fifty years since 1965. The model contains our determination for the further development of the N-gauge world in the coming fifty years. Therefore, the C59 can be regarded substantially as an alternative model celebrating the 50th anniversary of N-gauge by KATO/ Sekisui Kinzoku, despite that no such a message was added to the relevant model. This picture shows a scene in which the C59 pulled the express night train "AKI" composed of Series 10 sleeping cars operated on the Kure line in the Hiroshima prefecture. This train was the last express train pulled by the large C59 or C62 steam locomotive on this line.

Fig.7-26 UNITRACK has made easier running of N-Gauge models possible since the first release of the system in 1980. The appearance has changed over the years, from the initial model with a style of PC (Pre-stressed Concrete) sleepers in light brown color, to the model with painted grey ballast and wooden sleepers molded in dark brown. In today's model, the grey ballast is molded in color. The special joint called the "Uni-joiner" has a dual role of both mechanical and electric connection. A metal joint is inserted into the plastic casing, preventing the connector from deforming or from breaking contact with the rails and, in turn, ensuring the stable electric connection of the rails needed for reliable operation. The "Uni-joiner" design has been modified repeatedly to ensure the tightest and most stable connection possible.

Fig.7-27 Double Track UNITRACK was developed to fit its style to the trains on urban or Shinkansen lines. The curved double tracks are canted – a first for ready-to-run N-gauge tracks. The track provides realism and serves to compensate for centrifugal forces acting on trains. Today, three different UNITRACKs curves with different radii are supplied to both of Japanese and international markets.

Fig.7-28 UNITRAM is a specific double track system for the operation of street cars in a downtown city setting. The reproduction of street embedded tracks has long been a dream of modelers, because the grooves of a minimum

and uniform width for the passage of wheel flanges along the inside of rails are almost impossible to make by hand. UNITRAM provides beautiful and functional tracks for street running, and is welcome in the markets of Japan and foreign countries.

Fig.7-29 Downtown structures referred to as DIOTOWN were developed alongside UNITRAM, which enables the construction of street scenes and the reproduction of a city atmosphere with ease.

Fig.7-30 The motorized turntable is an innovative item with both a realistic appearance and stable operation.

Fig.7-31 With the "Sound Box" system, modelers can reproduce a variety of motion-synchronized train sounds simply by changing the inserted "sound card".