

September 1990

Field Note N°: Skidding/Forwarding-15
Previous Reference Sheet N°: None

J.M.S. RING-TYPE TRACTION CHAINS FOR ALL-TERRAIN VEHICLES (ATVs)

INTRODUCTION

J.M.S. Inc. recently introduced a ring-type traction chain for all-terrain vehicles (ATVs) onto the market. In February and June 1990, FERIC personnel tested the chains at the Larose Forest near Bourget, Ontario while evaluating a self-loading trailer attached to an ATV.

The chains were installed on the rear wheels of both a four and a two-wheel drive Honda Fourtrax ATV, each equipped with a 300-cc motor. These vehicles were used to pull a trailer carrying loads of logs weighing from 500 to 900 kg (up to 0.9 m³ of solid wood). The wood was loaded at the stump and transported 1.2 km to a small sawmill.

The purpose of this field note is to inform interested readers of the availability of these chains and to pass on the observations gathered during this experiment.

DESCRIPTION

The chains (Figure 1) are made of six steel rings each having an outside diameter of 128 mm and a cross section of 11 mm. On each ring, at 120° intervals around the circumference, three rectangular lugs (25 × 6 mm) are welded and protrude 17 mm to provide added traction. The chains joining the rings have a cross section of 5 mm. Each tire chain weighs 5.75 kg and the retail price of a pair runs between C\$130 and 145 (August 1990).

OPERATING CONDITIONS

The tests took place at the Larose Forest in a 35-year-old red pine plantation on flat ground. In February, the snow cover was about 35 cm deep. The snow covered frozen ground, and was hard packed from rain and mild weather which preceded the trial period. The access road which followed was well compacted and the chains provided excellent traction without the ATV wheels sinking into the hardened surface. The final leg to the sawmill was made on the gravel shoulder or in the drainage ditch of the main road at speeds up to 25 km/h. In June, the only real obstacles encountered were a few stumps left from the winter cut.

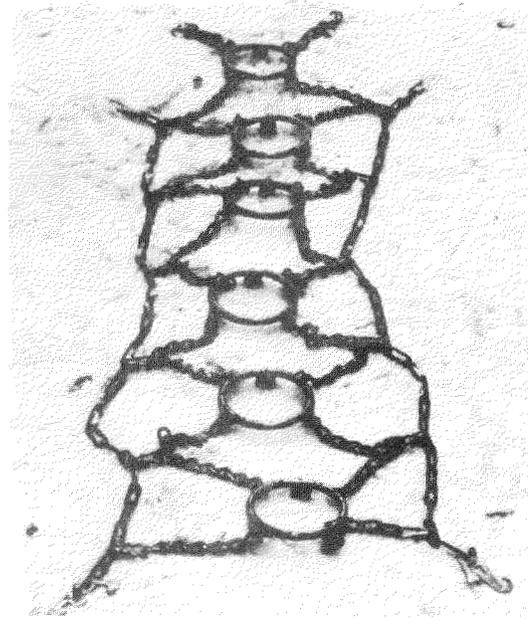


Figure 1. J.M.S. traction chain.

TESTS UNDERTAKEN

Question #1. Can chains be installed only on the rear wheels of a 4×4 ATV without risk of damaging the transmission?

The reduction in synchronization between the front and rear wheels when using chains was evaluated. The number of wheel revolutions required to travel a known distance on a forest road covered with hard-packed snow as well as on an asphalt surface were counted. These tests were done with and without chains installed on the back wheels.

On the hard-packed snow, the front/back revolution ratio remained unchanged (1.02) when chains were installed on the rear wheels only. Thus, there was no clutch slippage. However, the test results showed that the number of revolutions registered over a 50-m distance was 1% less with chains. This indicates that the chains increased the perimeter of the wheels slightly. How much? Assuming that the traction of the chains eliminates any slip, any asynchronism between the

wheels is completely absorbed by slippage of the front tires. It can therefore be concluded that the perimeter increase was about 1% or approximately 3 mm on the radius. The effect of reduced synchronization is thus minimal on the hardened snow of a forest road and is absorbed by slippage of the front tires.

A similar test was carried out on an asphalt road, but this time with a 4×2 ATV to avoid all interference of front traction on the results. With the chains, the number of revolutions was close to 2% less, representing an increase in the radius of the rear wheels of about 7 mm. This indicates that the increase in perimeter of the wheels caused by the chains is about two times greater if the ATV travels on a surface where the lugs do not penetrate into the ground. If the rolling surface also offers good traction to the front tires and to the rear chains (e.g., asphalt), the asynchronism of the wheels could perhaps affect the transmission over time. However, ATV vehicles do not normally operate continuously under such conditions which are neither typical of forest operations nor do they require the use of chains. The ATVs used by FERIC were equipped with tightly-adjusted clutches situated at wheel level which can absorb any occasional asynchronism between the wheels that is not absorbed by slip of the front wheels (e.g., while crossing a paved road).

Question #2. What is the relative improvement in traction gained on snow by equipping a 4×4 ATV with YETI tracks or J.M.S. chains in the rear?

The ATV was subjected to different hauling tests to answer this question. Under dense granular snow conditions on top of an ice base, the J.M.S. chains and YETI tracks increased traction by as much as 60% as compared to an ATV with regular tires only. During the tests, the J.M.S. chains actually had sufficient traction in the snow to immobilize the wheels and cause slippage of the clutch. The measured performance was slightly better with the J.M.S. chains than with the YETI, but the situation would likely have been reversed in deep, powdery snow.

Question #3. How do the J.M.S. chains help an ATV to pull a load of wood?

During tests of transporting logs with a self-loading trailer, the traction provided by the J.M.S. chains permitted easy travel in the plantation and improved stability when driving on the forest road and on the side of the main road. The aggressiveness of the chains prevented locking of the ATV's rear wheels which sometimes happens when braking. Without chains and with a load of almost 700 kg, the rear wheels readily blocked when braking on snow. There was thus a risk of jackknifing on curves, before a stop, or while descending a slope.

The orientation of the lugs also contributes to increased lateral stability of the ATV. Net loads of up to 900 kg

could be towed without feeling the jackknife effect described above. Note that it is not recommended to haul more than 350 kg (the weight of the ATV and driver) without special measures being taken to maintain safe operation (e.g., traction chains on ATV, brakes on trailer).



Figure 2. An Honda Fourtrax 4×4 ATV pulling a trailer loaded with 800 kg of wood using J.M.S. ring-type chains.

CONCLUSION

The J.M.S. ring chains provide good traction and lateral stability for the ATV under spring snow conditions and in the summer. Tests show that their installation on the rear wheels only, changes the synchronization between the front and back wheels by 1 to 2% depending upon the penetration of the lugs into the ground. This should not create transmission/drive problems under the conditions usually encountered in the forest where the use of chains may be required.

INFORMATION

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