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Informal Note #13

TAXONOMY OF CONVENTIONAL RETARDER SPEED CONTROL SYSTEMS

Background

The conventional retarder speed control system is a misnomer. In particular, there are many system configurations one can put together with so called "conventional" hardware. Herein, we discuss several of these configurations.

Generic Hardware Types

An "economic" retarder is a simple weight responsive hydraulic retarder. In applications as tangent point retarders, it allows a single preset release speed.* Cars above the release speed are slowed down to the release speed; cars below the release speed are not acted on by the retarder. For this type of retarder, retarder beams sit outside only one rail. Hydraulic action merely cocks the retarder arms, the weight of the car causes the beams to squeeze the wheels. Thus, the breaking force depends on the weight of the car. ABEX uses a "notched-rail" sonic speed sensing device; other vendors use radar. This form of retarder is relatively cheap and is generally used as tangent point retarders; however, there have been a limited number of applications as master/group retarders. No computer or manual control is necessary. B & M's latest bid on these retarders (39 ft. long) was \$35,000 each not installed.

A "full-capability" retarder is normally used as master and group retarders. The retarder actuation can either be electro-pneumatic, electro-hydraulic, or electric. For this type of retarder, the retarder beams can sit aside both rails or only one rail. The retarder can exert variable squeezing forces based on weight categories and achieve variable exit speeds. The retarder can be controlled manually by a retarder operator or automatically by a computer. Speed sensing is normally through a doppler radar. The retarder itself is expensive, and the automatic computer control is even more expensive. UP's latest bid for one master and three group retarders including

*The term "economitic" was coined by B. Gallacher of the SP.

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automatic control was \$3.5 million installed. My "guess" is that over \$1 million was for the process control computers and software.

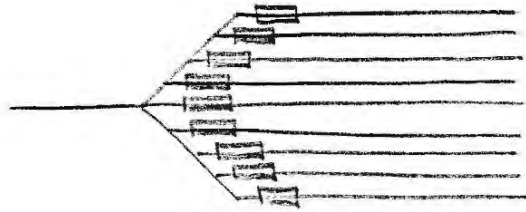
Poor Man's Hump Yard

The term poor man's hump yard is a phrase coined by Barney Gallacher of the SP. It refers to a very cheap hump yard which is cost competitive with flat yards. Normally, we are talking about yards with 24 class tracks or less.

SP has pioneered the development of these types of yards; they currently have six on their property. Figure 1A shows the design favored by SP. SP's design uses only economic tangent point retarders (i.e., no master or group retarder) thus no computer to control retarders is necessary. The yard is designed to deliver the hardest rolling car to the tangent point at 4 mph; the tangent point retarders are designed to slow and release easier rolling cars at 4 mph. Barney claims he can get 3 cars per minute over the hump and that the design is good up to 24 class tracks. The key to the design (as claimed by SP) is that the tangent point retarders squeeze the wheels and thus straighten out the trucks thus narrowing down the "band" of rolling resistances on the class tracks, thus giving superior coupling performance. An important factor for a successful operation is a "tight design" in which the distance from crest to clear point on the outside track is kept to a minimum (i.e., approximately 550 ft). The hump is approximately 6 feet high; the actual height varies depending on the hardest rolling resistance assumed for the local operation.

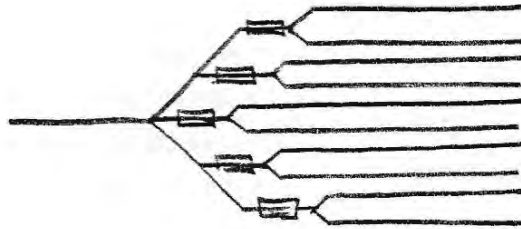
Figure 1C shows an alternative design using a single "full-capability" master retarder. The UP recently came to SRI to experiment with the PROFILE simulation on the performance of such a system for their new yard at Yermo, California. They abandoned the system when it was demonstrated that the cars could not be humped at 3 cars per minute. We do not know the humping rate for such a system. Also, we do not know if such a system has been implemented.

A



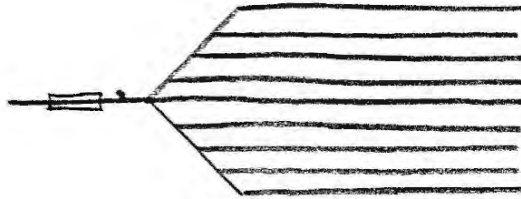
ECONOMATIC RETARDER
AT TANGENT POINT

B



ECONOMATIC RETARDER
PER TWO TRACK GROUP

C



FULL-CAPABILITY RETARDER
FOR MASTER

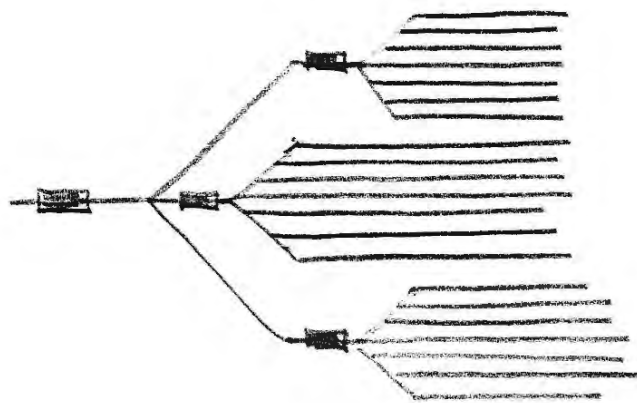
FIG. 11 POOR MAN'S HUMP YARD

For the Boston and Maine's East Deerfield Yard, SRI is experimenting with using one economatic retarder and SP's design philosophy except with two or three track groups (see figure 1B). This was done to keep the cost down. As far as we know such a system has never been tried. The system is likely to allow slightly higher coupling impacts than if the retarders were at the tangent point since we do not have the truck straightening effects of a tangent point retarder. (In this design, the cars would go around curved track after leaving the retarder causing trucks to be skewed.)

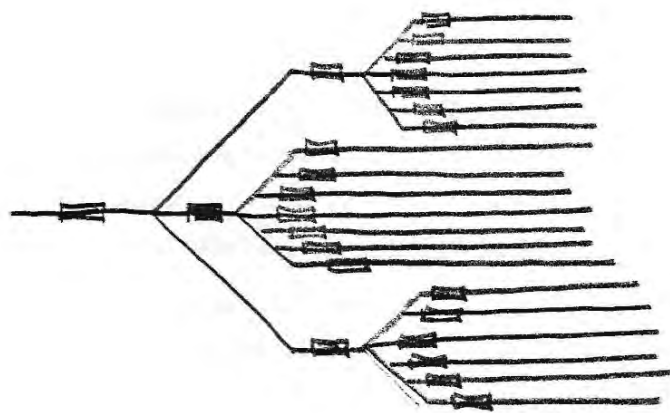
Normal Hump Yard

The normal configuration for a large yard is to have "full-capability" retarders for master and group retarders (see figure 2A). Between 8 to 10 tracks per group have been tried with 8 tracks per group the norm. A cheaper system (in terms of initial capital cost and not operating cost) is to have a manually operator controlled system rather than a computer controlled system. It is entirely possible that economatic retarders could be used as master and group retarders to obtain a lower cost system. It is not known whether this type of system exists or what its capability may be.

The "ultimate" system was designed for SP's West Colton Yard. The yard uses variable speed retarders for master and group, and economatic retarders at the tangent point. The yard can achieve 7 cars per minute over the hump with good coupling performance on the class tracks.



FULL-CAPABILITY
(OR ECONOMIC?)
RETARDER FOR
MASTER AND
GROUP



FULL-CAPABILITY
RETARDER FOR
MASTER AND GROUP
AND ECONOMIC
TANGENT POINT
RETARDERS

FIG. 2: NORMAL HUMP YARDS