

Table 9.6
Transmission efficiency of a Shimano Nexus seven-speed hub

Gear	Ratio	First test	Second test
1	0.632	0.91	0.91
2	0.741	0.94	0.93
3	0.843	0.87	0.87
4	0.989	0.86	0.89
5	1.145	0.86	0.87
6	1.335	0.92	0.93
7	1.545	0.91	0.91

Source: Data gathered by Angus Cameron, reported in Puckett 1999.

Table 9.7
Transmission efficiency of a Shimano seven-speed hub gear

Gear	Relative distance per revolution of crank	Transmission efficiency at 100 W power	Transmission efficiency at 200 W power
1	2.9	0.87	0.92
2	3.3	0.90	0.915
3	3.8	0.76	uncertain
4	4.4	0.865	0.87
5	5.2	0.82	0.83
6	6.0	0.92	0.92
7	7.0	0.91	0.91

Source: Data gathered by Jan Verhoeven, reported in Puckett 1999.

of step-up and step-down transmissions are different, but in this method the efficiencies of these transmissions are combined. Quasi-static tests raise the concern of oil-film thicknesses being reduced, and in any event, careful averaging is needed, because chordal action alters mechanical advantages by several percent during the passage of a single tooth. In dynamic testing, such averaging is automatically provided by inertial effects.

What is the optimum number of gear ratios?

To some people, the question that heads this section is a strange one: there are enthusiasts who believe that the only authentic bicyclists are those who ride fixed-gear, single-speed machines, even over mountain passes. At the

Table 9.8
Transmission efficiency of a Sachs Elan twelve-speed hub gear

Gear	Meters per revolution of crank (28-inch wheels)	Transmission efficiency at 100 W power	Transmission efficiency at 200 W power
1	2.2	0.87	0.92
2	2.7	0.91	0.95
3	3.2	0.925	0.965
4	3.8	0.90	0.91
5	4.3	0.90	0.91
6	4.8	0.905	0.905
7	5.1	0.88	0.88
8	5.7	0.88	0.88
9	6.1	0.88	0.88
10	6.6	0.855	0.86
11	7.1	0.865	0.87
12	8.5	0.86	0.88

Source: Data gathered by Jan Verhoeven, reported in Puckett 1999.

Table 9.9
Efficiencies of a Shimano Deore LX derailleur drive

Number of teeth on chainwheel	Number of teeth on rear sprocket	Meters per revolution of crank (28-inch wheels)	Transmission efficiency at 100 W power	Transmission efficiency at 200 W power
22	28	1.7	99	98.5
22	24	2.0	98	98
22	21	2.2	96	98.5
22	18	2.7	96	96.5
32	21	3.1	93.5	95
32	18	3.8	93.5	94.5
32	16	4.2	94	94
32	14	5.0	94.5	93.5
42	16	5.7	93	93
42	14	6.6	91.5	91.5
42	12	7.6	89.5	91.5
42	11	8.3	88	91.5

Source: Data gathered by Jan Verhoeven, reported in Puckett 1999.