

Summary of the Four Energy Systems Applications for High School Runners

Energy System	Percent of HR Max	Types of Training	Duration	Perfect Training Distance & Pace	Recovery Time Rule of Thumb
Aerobic Conditioning or Endurance	65-80%	Easy Distance	30 - 75 minutes	All longer runs @ 65-80% HR Max	Not needed.
Anaerobic Conditioning or Endurance	86-92%	Tempo Lactate Threshold Cruise Intervals Fartlek	15 to 25 minutes 15 to 25 minutes 5 to 10 minutes 15 to 25 minutes	20 minutes @ slightly slower than 10K race pace	Not needed.
Aerobic Capacity	95-100%	Repeats @ 5K pace Repeats @ 3200 pace Fartlek	2 to 5 minutes 2 to 5 minutes 2 to 7 minutes	¾ Mile Intervals @ 5K race pace	1 to 1 or 3 to 4 minutes
Anaerobic Capacity	100 % @ or near the end of the workout	Repeats @ 800m pace Repeats @ 1200m pace Repeats @ mile pace	30 sec to 1 min 45 sec to 90 sec 1 min to 2 min	200m @ 800m race pace 300m ran between 800m & mile race pace 400m @ mile race pace	(Varies between reps depending on training) For 800m training allow 8-10 minutes between sets. For 1200m training allow 4-5 minutes between sets. For mile training allow 3 minutes between sets.

Energy System	Physiological Benefits/Increases
Aerobic Conditioning or Endurance	Total blood volume. Number of mitochondria in the muscle cells. Amount of oxidative enzymes in the muscle fibers. Number of capillaries in the muscle fibers. Endurance of “ST” and certain “FT” muscle fibers. Amount of fat you use as fuel. Amount of muscle glycogen that can be stored. Strength of the connective tissues.
Anaerobic Conditioning or Endurance	Improves your anaerobic or lactic threshold by increasing the distance you can sustain for most running speeds. Strengthens cardiovascular and musculo-skeletal systems.
Aerobic Capacity	Leg speed The development of “FT” muscle fibers Amount of activity of the enzymes that break down glucose for use by the muscle fibers. Neuromuscular efficiency Blood’s ability to buffer lactic acid Aerobic capacity or VO2Max beyond what can be accomplished by solely training only the conditioning energy systems.
Anaerobic Capacity	Leg speed and strength. Major improvements in running efficiency. Better tolerance to lactic acid in the blood.

-10 Percent Rule-
Never increase time/mileage more than 10% a week, month & year. Never train any one energy system more than 10% except for the aerobic conditioning system (75%). The other three should never total more than 25% combined.
Coach Joe Vigil’s Formula for Aerobic Capacity Training Pace Using Track PR’s
1. Convert the mile to seconds 2. Multiply by 100 3. Divide by 85 and convert to minutes This would be the mile repeat pace.
Use the same approach for 800 & 1000 PR’s to calculate 800/1000 repeat pace.
Progression
While the number of reps and rest stay constant the pace moves to 88% of PR’s and then to 91% of the athletes PR’s by the end of the season.

Calculating Equivalent Race Times (All conversions done by seconds)
Jack Daniel’s 2.2 x Prior Distance
To convert a 2:00 - 800m to 1600m to 3200m 1. Take 120 seconds x 2.2 = 264 sec = 4:24 2. 264 x 2.2 = 580.8 sec = 9:40.8 for 3200
World Record Formula
Take the world records for the distances you are comparing and calculate your projected time. This allows for same sex equations. The formula using the above example:
$\frac{800 \text{ Men's WR}}{\text{Men's Mile WR}} = \frac{101.11}{223.13} = \frac{120 \text{ sec}}{X}$
X = 264.8 sec = 4:24.8
$\frac{800 \text{ Women's WR}}{\text{Women's Mile WR}} = \frac{113.28}{252.56} = \frac{120 \text{ sec}}{X}$
X = 267.5 sec = 4:27.5