The Principal Requirements of a Take-Up Winch

1) *Behavioural Monitoring of the principal weaknesses of Take-Up Trolleys and Rope Transport.*
    a. Friction in Take-Up Trolley Wheels is a major friction problem and requires measuring, logging and reporting to Central Control.
    b. Friction in the Rope & Sheave Transport System to be measured and logged to Central Control.
    c. The Winch Brake needs to be monitored also.

2) *Winch Speed*
    a. The 'Fixed Speed' Winches available locally are derived from Haulage Winches. They are all the same speed of about 6 metres per minute. Controlling Running Tension with a slow winch is a 'piece of cake' but it always too slow for start-up. Steel Cord Belts are 10 times less elastic than fabric belts and therefore the Take-Up Winch needs to be 10 times slower.
    b. Faster winches need higher power but large motors cannot tolerate the Start/Stop requirement of Fixed Speed Winches.
    c. Variable Speed Winches provide the slow winch for running adjustments and the fast winch for start-up and stopping.
    d. Take-Up Winches with Variable Speed Drive, can be 'super cycled' under strictly controlled conditions to effectively double the performance of a winch.
    e. With AC Variable Speed Drive, Take-Up Winches can be any size. The gap between Fixed Speed Winches and High Speed Winches has now been closed. Specifying the winch can be done optimally. Risky excessive Starting tensions are no longer necessary.
    f. Take-Up Winches with AC Variable Drive now compete with both Torque-Controlled Winches as well as Gravity Tower Systems.

3) *Control Response Time*
    a. Short belts have a short 'Time Constant' where the rate of change of tension calls for a very fast Winch Brake to be available.
    b. Steel Cord Belts are 10 times more critical.
    c. We have seen PLC Systems with a response time of 2 seconds on a belt with a rate of change of tension greater than 100% of running tension per second – completely unworkable.
    d. The Control System's response speed is time critical to satisfactory performance.

4) *Control Philosophy*
    a. A Gravity Tower always looks so simple and a Tension Controller is a 'Black Box' which is perceived to be unreliable. In reality 99% of all problems with Conveyor Tension Control, whether Gravity of Winch are friction related.
    b. Behavioural Monitoring is only possible on conveyors with Tension Transducer feedback.

c. Designing a Tension Controller system looks so easy; to evolve programs to process the dynamic signals emanating from the Tension Signal as well as, inter alia, the Winch Motor Current is a challenging task. This development has taken several years. From our 32 years of tension experience in tension control, we know exactly what problems are certain to occur in each and every system.

5) *Communications*
   a. Communication of meaningful data on the condition of a conveyor is a big step forward.

6) *Safety*
   a. The EGT-28AX and EGT-24FX Controllers have comprehensive safety routines to ensure that e.g. A potentially dangerous snagged rope will shut the system down instantly.

7) *AC Variable Drives*
   a. The performance and facilities of the major manufacturer's AC Variable Drives is nothing less than outstanding. Precision control is a given for almost any application.
   b. Adding an AC Variable Drive to a Take-Up Winch dramatically eliminates the severe mechanical stress associated with Direct-on-Line Starts. Couplings last much longer.
   c. If the tension controller provided the acceleration function for the Main Conveyor drive, an optimal starting acceleration which would compensate for belt loading would result. The EGT-28AX has this function built in.

8) *Aborted Starts and Belt Stopping*
   a. The possibility of an aborted start is always present. Loss of power at any stage will cause transient tension waves to 'echo' up and down the belt. The better the Take-Up Winch can handle Belt start-up will automatically 'rub off' on the stopping behaviour. However, loss of power during acceleration is the worst case scenario. Some winch manufacturers have integrated a slip clutch into the winch mechanism. This is still in development but promises a good and practical solution to this problem.
   b. Stopping a belt is almost always done by dropping the power instantly. A controlled stop, i.e. A decelerated belt would be a more civilised method but might mean a slightly lengthened process. Safety of personnel will always be the dominating factor. A softened stopping routine might actually be an improvement.